Massachusetts Military Reservation

INSTALLATION RESTORATION PROGRAM

2nd Five-Year Review, 1998-2002
Massachusetts Military Reservation (MMR)
Superfund Site
Otis Air National Guard Base, MA

May 2003

Prepared by:

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Contract No. F41624-01-D-8537

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BOSTON, MASSACHUSETTS 02114-2023

May 6, 2003

Robert M. Gill
Remediation Program Manager
HQ AFCEE/MMR
322 East Inner Road
Otis ANG Base, MA 02542-5028

Re: *2nd Five-Year Review, 1998-2002, Massachusetts Military Reservation (MMR) Superfund Site, Otis Air National Guard Base, MA*

Dear Mr. Gill:

Thank you for the opportunity to review the *2nd Five-Year Review, 1998-2002, Massachusetts Military Reservation (MMR) Superfund Site, Otis Air National Guard Base, MA* report dated May 2003. Upon review, the EPA concurs with the findings that all remedies as implemented or in the process of being implemented by AFCEE are protective of human health and the environment per the protectiveness statements in the report.

The report reviews over 80 sites including source areas and groundwater plumes, and is consistent with EPA's Comprehensive *Five-Year Review Guidance, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-03B-P* (June 2001). For sites which do not have a final remedy in place, AFCEE's commitment to pursue the CERCLA investigation and cleanup process to a successful conclusion is clear.

This second five-year review was triggered by the first remedial action in October 1993. Consistent with Section 121(c) of CERCLA and (OSWER) *Directive 9355.7-03B-P*, the next statutory, required five-year review must be finalized prior to October 2008.

If you have any questions, please contact me at 617-918-1201 or Robert Lim at 617-918-1392.

Sincerely,

Susan Studlein

Susan Studlein, Acting Director
Office of Site Remediation & Restoration

cc. Dennis Gagne, EPA
Kymberlee Keckler, EPA
Meghan Cassidy, EPA
Elizabeth Mason, EPA
Paul Marchessault, EPA
Robert Lim, EPA
Michael Hurd, EPA-HQ
Len Pinaud, MADEP

2nd Five-Year Review Report (1998-2002)
Massachusetts Military Reservation (MMR) Superfund Site
Otis Air National Guard Base (ANGB), Massachusetts

EXECUTIVE SUMMARY

A five-year review was conducted on all the MMR IRP sites currently being cleaned up under the Federal Facility Agreement (FFA) for the Massachusetts Military Reservation (MMR) Superfund site, signed July 17, 1991 and its amendments. This review was done according to the current, applicable EPA guidance (OSWER 540-R-01-007, dated June 2001) and it covers all the remedies for all the IRP sites at the MMR, regardless if the sites are closed or if their treatment systems may no longer be operating.

The purpose of a five-year review is to evaluate the implementation and performance of site cleanup remedies to determine if these remedies are, or will be, protective of human health and the environment. Going beyond the review requirement, sites where remedies were never required or where remedies have not yet been selected were evaluated for their potential threat to human health and the environment.

Over eighty individual sites, including ground water plumes and source areas, were evaluated to determine if their cleanup remedies were still functioning as intended by the decision documents. In addition, the exposure assumptions, toxicity data, cleanup levels, and other criteria used to make the cleanup decisions were examined in today's light to determine if any significant changes had occurred, or if any new information had come to light that could call into question the protectiveness of these remedies.

As a practical matter, the MMR IRP sites were grouped into four categories, based on their status in the CERCLA cleanup process. The four categories are: 1) No Further Action, 2) Remedy Complete, 3) Remedy Functioning, and 4) Under Investigation.

All sites where no further action was proposed in lieu of a remedial action (Category 1) were found to be protective. These were sites where a closure decision had been made based on data gathered during one of the study phases. In addition, all sites where a remedial action was chosen and completed (Category 2) were also found to be protective.

Most MMR IRP cleanup remedies currently in operation (Category 3) were found to be protective of human health and the environment. Some of these remedies, such as the ground water extraction and treatment for plumes, are protective in the short term and will be fully protective, once cleanup goals have been achieved. Detailed information can be found in the technical assessments of these sites.

For sites still under investigation (Category 4), protectiveness assessments were deferred, as allowed by the guidance. Even though five-year review assessments were deferred, all Category 4 sites were evaluated and found to pose no imminent or substantial threat to human health or the environment.

There were some specific issues identified with some of the Category 3 and Category 4 sites. These have been summarized in Table 7, along with their recommendations and follow-up actions. Although none of these issues adversely affects the overall protectiveness of the site, the recommendations and actions will be followed up using the regular activities of the MMR IRP stakeholder groups (e.g. Plume Cleanup Team, Senior Management Board, etc.), which include the public, community advisors, and the regulators.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Otis Air National Guard Base/MMR		
EPA ID *(from WasteLAN)*: MA2570024487		
Region: 1	**State:** MA	**City/County:** Otis ANGB/Barnstable
SITE STATUS		
NPL status: fl Final Deleted Other (specify)		
Remediation status (choose all that apply): fl Under Construction fl Operating fl Complete		
Multiple OUs?* fl YES NO	**Construction completion date:** ___ / ___ / _____ N/A	
Has site been put into reuse? YES fl NO		
REVIEW STATUS		
Lead agency: EPA State Tribe fl Other Federal Agency United States Air Force		
Author name: James A. Baker III		
Author title: Environmental Engineer	**Author affiliation:** Air Force Center for Environmental Excellence (AFCEE)	
Review period:** 10 / 17 / 1997 to 10 / 15 / 2002		
Date(s) of site inspection: ___ / ___ / _____ N/A		
Type of review: fl Post-SARA Pre-SARA NPL-Removal only Non-NPL Remedial Action Site NPL State/Tribe-lead Regional Discretion		
Review number: 1 (first) fl 2 (second) 3 (third) Other (specify) _____		
Triggering action: fl Actual RA Onsite Construction at OU # 2 Actual RA Start at OU#____ Construction Completion Previous Five-Year Review Report Other (specify)		
Triggering action date *(from WasteLAN)*: 10 / 15 / 1992		
Due date *(five years after triggering action date)*: 10 / 15 / 1997		

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* - Technical Assessments and Site Discussions have unique page numbering systems (e.g. Section #, Page #).

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2nd Five-Year Review, 1998-2002
Massachusetts Military Reservation (MMR) Superfund Site
Otis Air National Guard Base (ANGB), Massachusetts

1.0 Purpose

The purpose of the five-year review is to evaluate the implementation and performance of a site cleanup remedy in order to determine if the remedy is or will be protective of human health and the environment. The EPA guidance for five-year reviews (OSWER 540-R-01-007, dated June 2001) requires each Site be evaluated and three questions answered regarding the protectiveness of the cleanup actions that have occurred or are occurring at the Site. These three questions are:

A. Is the remedy functioning as intended by the decision documents?

B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

C. Has any other information come to light that could call in to question the protectiveness of the remedy*?*

For the purposes of this five-year review, the word "Site" (capital "S") refers to the collection of all the individual source areas and ground water sites at the MMR that are being cleaned up pursuant to the Federal Facility Agreement (FFA) for the Massachusetts Military Reservation (MMR) Superfund Site, signed July 17, 1991 and its amendments. Each of the individual sites was evaluated pursuant to the five-year review guidance. The methods, findings, and conclusions of the reviews are documented within this five-year review report. In addition, this five-year review report identified certain issues found during the review and identified specific recommendations to address them.

The Air Force Center for Environmental Excellence (AFCEE) prepared this five-year review report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the Site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such Site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

AFCEE interpreted this requirement further. In the NCP, 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

AFCEE conducted a five-year review of the various cleanup evaluations, decisions and remedies implemented at the MMR Superfund Site in Otis ANGB, Massachusetts. From January 2002 through October 2002, the AFCEE Remedial Project Manager (RPM) and his staff performed the work for this review. This report documents the results of that review.

This is the second five-year review for the MMR Superfund Site, covering the period 1998-2002. The triggering action for this statutory review began with the initiation of the remedial action on-site construction date of the Chemical Spill No.4 (CS-4) treatment system on October 15, 1992. As a result of this triggering action, the first five-year review, covering the period 1992-1997, was published in March 1999. There are no open issues from this report.

This five-year review is required at the MMR Superfund Site because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

1.1 Exception

By regulation, the contaminated sites at MMR that are being cleaned up by the MMR Impact Area Ground Water Study Program (IAGWSP), pursuant to the U.S. EPA Region 1 Administrative Order, under the authority of the Safe Drinking Water Act, are **not** included in this report.

2.0 Methodology

This five-year review report covers multiple remedies and operable units in the MMR cleanup program. Regardless of whether operable units or areas of concern are active or inactive, each MMR IRP site was evaluated according to the EPA guidance for five-year reviews. The status and progress of each site in the CERCLA cleanup process was considered in each evaluation. Figure 1 is a flow diagram that shows how this process works, in general.

Every effort was made to provide accurate references to the documents in the MMR administrative record that apply to each of these sites. Summaries of certain descriptive data were put in tabular form, to keep the size of this report manageable. Examples of these data are site chronologies, site backgrounds, investigative and remedial actions, and descriptions of progress made since the last five-year review. The reader is referred to the specific source documents, should they wish to examine all of the data.

The primary focus of this document is the technical assessment and any subsequent issues and required follow-up actions that relate to the continued protectiveness of the cleanup actions associated with each site. Individual assessments were made for every site that is open, and that has a remedy functioning or is still under investigation. Generally, these technical assessments and site discussions are found in the report sections concerning the Category 2, 3, and 4 sites.

2.1 Site Categorization

The first step was to sort all the sites into four general categories, according to each site's progression through the CERCLA cleanup process. The status of these sites ranges from closed (with or without a cleanup remedy), through still-functioning remedies, to under investigation. Figure 2 shows the categorization process. Titles and definitions of the four categories follow:

What is Superfund?
Superfund is the nickname for the environmental cleanup program legally known as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), a federal law, enacted in 1980. Superfund provides the authority through which the Federal government can compel people or companies responsible for creating hazardous waste sites to clean them up. It also created a public trust fund, known as the Superfund, to assist with the cleanup of inactive and abandoned hazardous waste sites or accidentally spilled or illegally dumped hazardous materials.

See also EPA's Superfund Internet Resources

Superfund Process:
http://www.epa.gov/superfund/action/process/sfprocess.htm
General Superfund:
http://www.epa.gov/superfund/index.htm

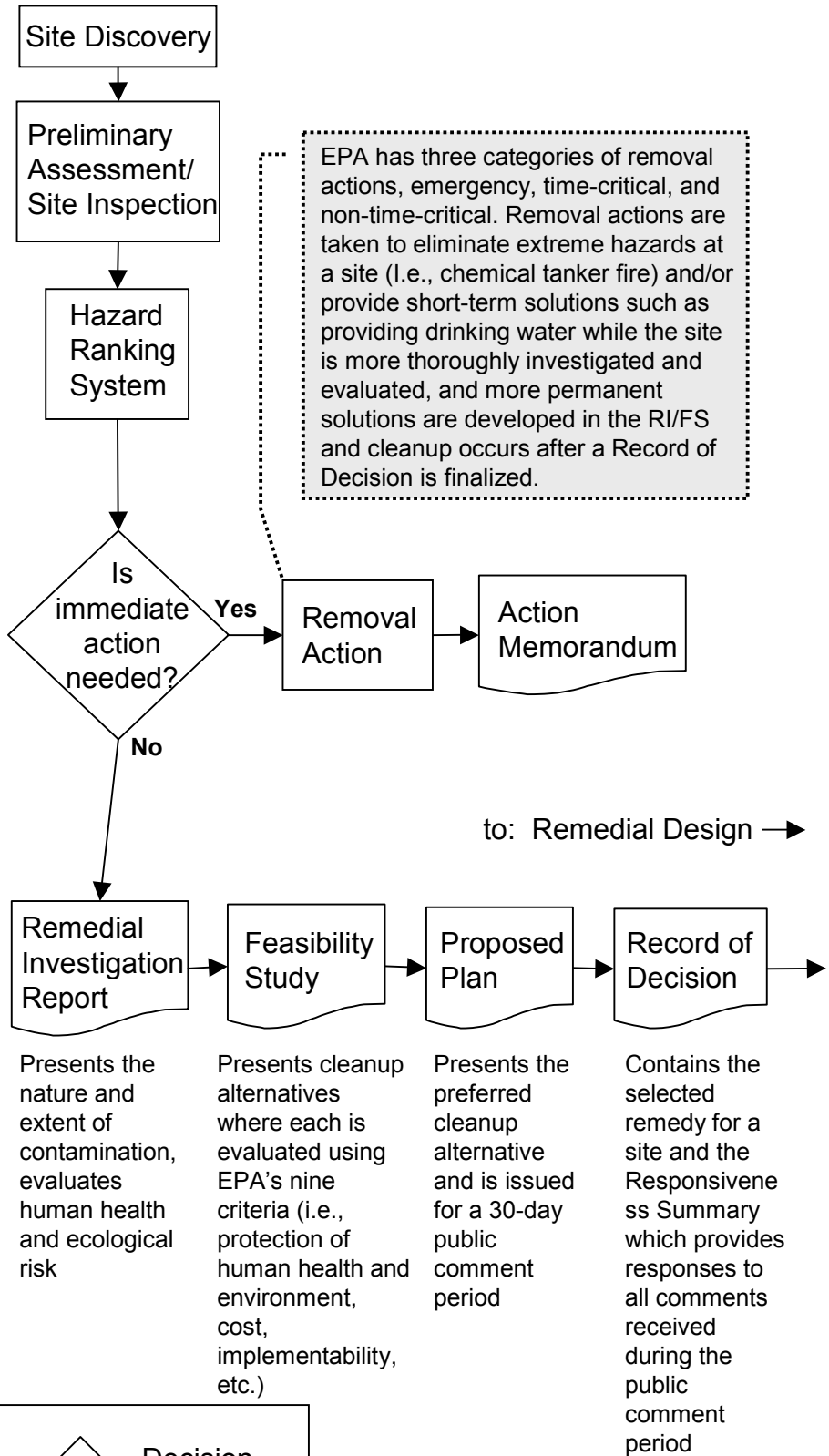


Figure 1:
Overview of Superfund Investigation & Cleanup Process

LEGEND:
Decision Point
Document
Process

Figure 1 continues →

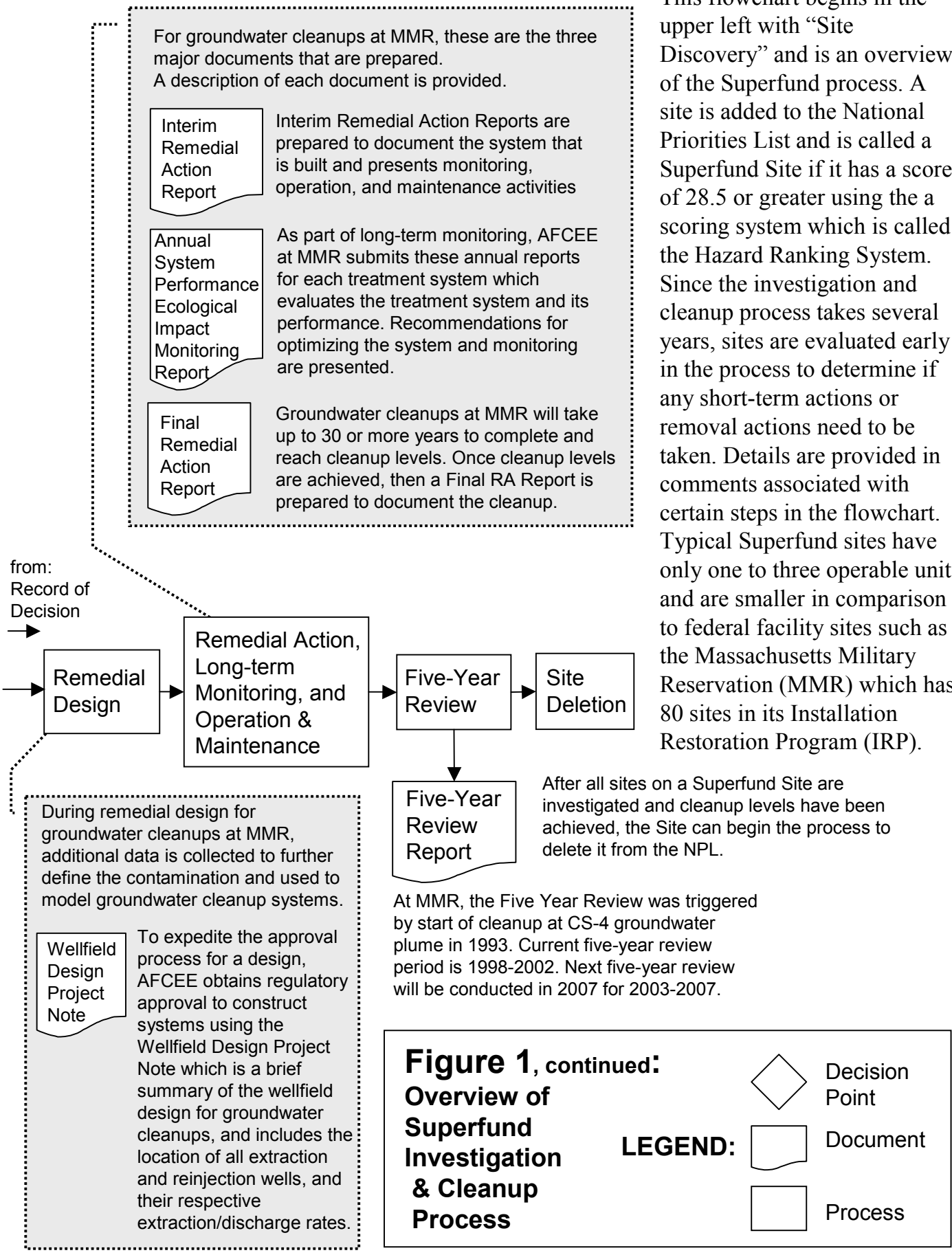
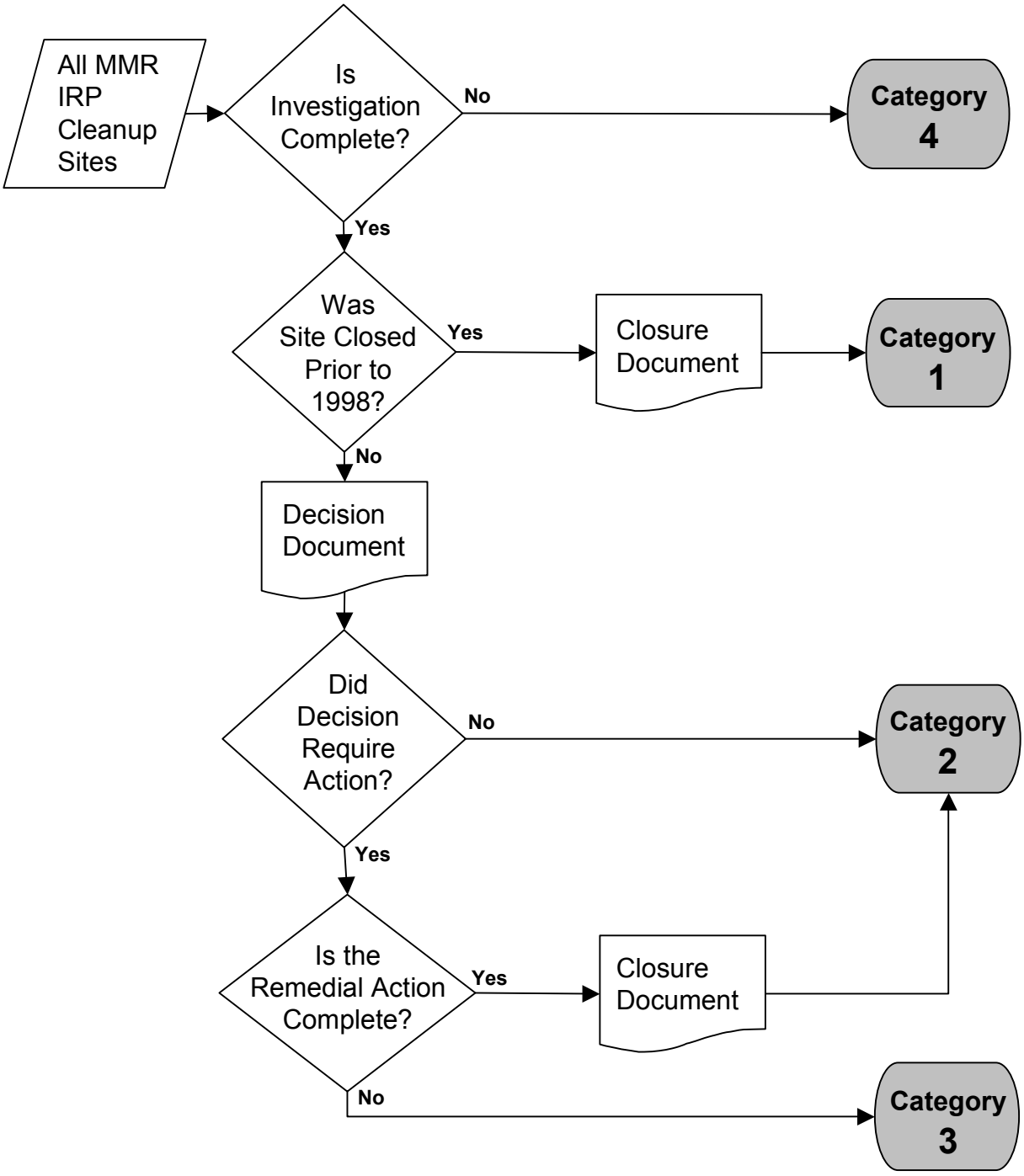


Figure 1, continued: Overview of Superfund Investigation & Cleanup Process

This flowchart begins in the upper left with "Site Discovery" and is an overview of the Superfund process. A site is added to the National Priorities List and is called a Superfund Site if it has a score of 28.5 or greater using the a scoring system which is called the Hazard Ranking System. Since the investigation and cleanup process takes several years, sites are evaluated early in the process to determine if any short-term actions or removal actions need to be taken. Details are provided in comments associated with certain steps in the flowchart. Typical Superfund sites have only one to three operable units and are smaller in comparison to federal facility sites such as the Massachusetts Military Reservation (MMR) which has 80 sites in its Installation Restoration Program (IRP).

Figure 2. MMR Five Year Review (1998-2002), Site Categorization Process

The EPA guidance on conducting five-year reviews was designed for the typical Superfund site that contains from one to a few operable units; however, federal facilities such as the Massachusetts Military Reservation (MMR) contain many operable units in varying stages of the investigation and cleanup process. To assist in assessing reviewing all 80 sites in the MMR Installation Restoration Program (IRP), they were grouped into four categories using the yes or no questions found inside the diamonds in the flowchart below.



2.1.1 Category 1 Sites, No Further Action

Category 1 sites have progressed through one or more CERCLA investigation phases and were subsequently closed without implementing any remedial action. There is an approved decision document that indicates no further action is needed and allows the unrestricted use of the land.

Because these sites are closed, they were evaluated in the technical assessment phase, to determine: if there were any changes in exposure assumptions, toxicity data, cleanup levels, and remedial action objectives, where appropriate (Question B), and if any other information has come to light that could call into question the decision to close the site based on investigation alone (Question C). These sites were not evaluated with regards to Question A, because no remedy was ever selected.

2.1.2 Category 2 Sites, Remedy Complete

Category 2 sites have progressed through one or more of the CERCLA investigation phases, then a remedial decision was made, and an approved remedial action was taken. The remedial action proceeded until the site was cleaned up and the site was subsequently closed. There is an approved decision document (e.g. Final Remedial Action Report) confirming the site was cleaned up in accordance with the remedial action objectives and allows the unrestricted use of the land.

Because the remedies are no longer functioning and these sites are closed, they were evaluated in the technical assessment phase to determine: if there were any changes in exposure assumptions, toxicity data, cleanup levels, and remedial action objectives, where appropriate (Question B), and if any other information has come to light that could call into question the protectiveness of the now-completed remedy (Question C). These sites were not evaluated with regards to Question A, because even though a remedy was selected, it is no longer operating.

2.1.3 Category 3 Sites, Remedy Functioning

Category 3 sites have progressed through one or more of the CERCLA investigation phases, then a remedial decision was made, a remedial action was approved, and the remedial action is either awaiting implementation or is currently functioning. The sites remain active and will not be closed until remedial actions are complete. For the purposes of this report, sites where active treatment is complete, but land-use or other institutional controls remain in effect, were included in this category.

Sites where remedies are still functioning were evaluated in the technical assessment phase to determine: if the remedy is still functioning as intended by the decision documents (Question A), if there were any changes in exposure assumptions, toxicity data, cleanup levels, and remedial action objectives, where appropriate (Question B), and if any other information has come to light that could call into question the protectiveness of the remedy (Question C).

2.1.4 Category 4 Sites, Under Investigation

Category 4 sites are currently in one of the investigation phases of the CERCLA process. There may be neither a complete risk characterization nor a decision regarding possible future cleanup of the sites. The AFCEE Remedial Program Manager has determined, in coordination with regulators and with the knowledge of the community, that these sites pose no imminent and substantial endangerments to human health and the environment.

In accordance with the five-year review guidance, any evaluation of the protectiveness of the remedial actions for these sites can be deferred until investigations are complete and a remedial decision is made. Investigations will proceed at these sites until it can be determined there are no unacceptable risks from the site or until remedial decisions can be made. Details regarding these sites will be reported in the next five-year review.

2.2 Site Data

A summary of information about each site has been provided, for background purposes. Each site's history is outlined, explaining what occurred at the site and how it became contaminated, if this information is known. In addition, the specific actions that were taken at each site, from investigation through clean up, are also summarized.

References are provided to all documents supporting the history, investigations, and cleanup decisions for each site. The reader may find the individual reports in the official Administrative Record of the MMR Superfund Site. This record is physically maintained at the MMR IRP Offices, located in Building 322 on Otis ANGB, MA. Electronic copies of documents may be found on-line at **http://www.mmr.org**, by clicking on **"Administrative Record"** under the main title block. In addition, the pubic libraries in the four towns surrounding MMR can help locate and obtain copies of specific documents using their on-line reference systems. Finally, a hard copy of the index of the MMR IRP Administrative record documents is maintained at the Falmouth Public Library.

2.3 Interviews and Site Inspections

Five-year review specific interviews were not conducted in preparation for this document because interviews were already conducted at MMR during the "Records Search" phase (late 1980's) of base-wide investigations to determine which areas to focus the cleanup program. As for any new potential sites, interviews, which are being conducted as part of the Impact Area cleanup project, are evaluated as they pertain to the IRP. During this review period, no new sites were identified as a result of those interviews.

Additionally, no five-year review specific site inspections were conducted because sites are routinely inspected as part of end-of-construction activities and ongoing operation and maintenance at ground water treatment plants.

2.3 Technical Assessments

Technical assessments were made of every site within each of the four categories to determine the current level of protectiveness of the cleanup actions that have occurred or are occurring at each

site. The three questions listed in Section 1.0 guided these technical reviews. Figure 3 is a diagram of the technical assessment process, as well as the public review process, covered later in section 4.0.

For sites where a remedy is still functioning, Question A requires an assessment of whether the remedy is still functioning as intended by the decision documents. This assessment was done by examining the histories of the ground water treatment system annual reports, the source area treatment system operating reports, and the status of any institutional control procedures required by the decision documents.

Question B requires that the assumptions and criteria used when the decisions were made to do the remedial actions and to eventually close the sites be reexamined using today's standards. Question C requires the RPM to examine any other information that may have come to light regarding the protectiveness of the selected remedy and the decision to close the site. These two questions apply to all sites, even those that were closed without performing a remedial action.

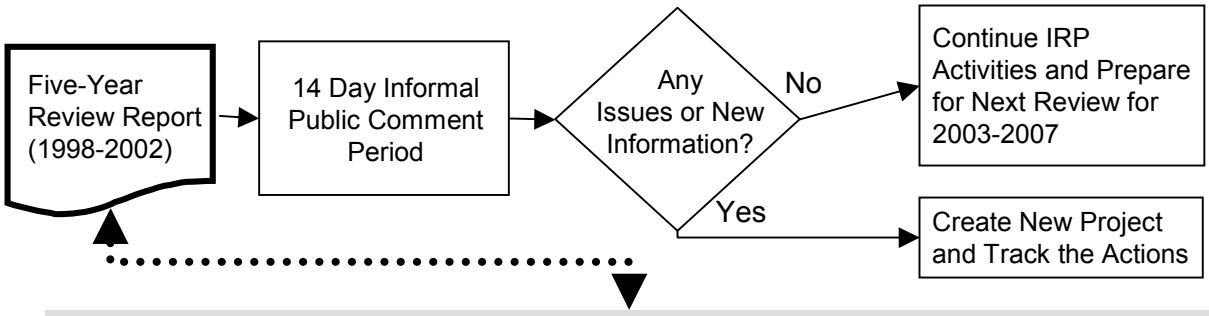
In doing these technical assessments, all the Maximum Contaminant Levels (MCL) that were factored in the decisions for theses sites were checked against current MCLs to make sure that a more conservative remedial action objective cleanup standard would not now be required. If an MCL that was used in an on-going or completed cleanup action has now become more restrictive, then the affected decision would have to be reevaluated using today's standards and adjustments to the cleanup process for that site would have to be made.

The technical assessments used information gathered during the routine surveillance of MMR soils and ground water over the reporting period, as well as inputs from the community, to determine if conditions along the exposure pathways and at the receptors, for example, had changed at any of the sites. Typical situations that would drive a reassessment of the remedy's effectiveness and protectiveness would be a shift in a ground water plume's direction of migration or new homes having been built in the vicinity of a plume. Again, the visibility of the MMR IRP activities assures these kinds of changes are routinely picked up and their consequences considered.

The public plays a vital role in the oversight of the MMR IRP cleanup program. Information from the community regarding these sites, or potential new sites, was evaluated and considered in the technical assessments.

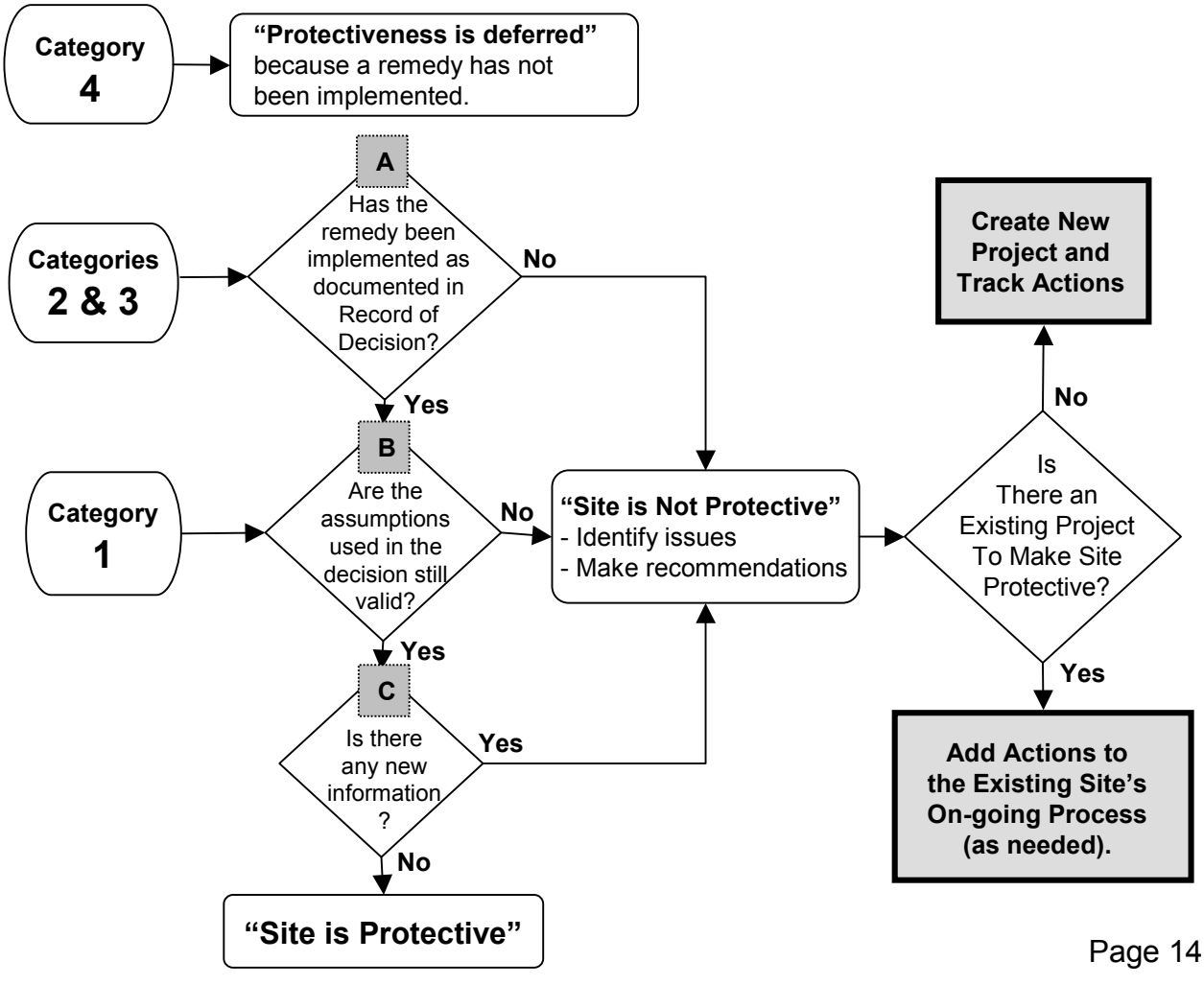
Figure 3. MMR Five-Year Review Report Public Review & Technical Assessment Processes

Upon completion of the five-year review, AFCEE will issue a Five-Year Review Report for a 14-day informal public comment period. The five-year review, covering the time period between 1998 to 2002, is conducted following EPA guidance to determine if remedies (i.e., cleanup actions) remain protective of human health and the environment. The flowchart below the dotted line describes the public review methodology.



MMR Five-Year Review Technical Assessment Process for Protectiveness Determinations

The four categories of MMR sites were evaluated to determine protectiveness, according to the process shown in the flow chart below. The five-year review's three technical assessment questions (A, B, C) are found in the diamonds. The five-year review is retrospective and is not used for planning purposes. At MMR, sites in Category 3 or 4 will have future public involvement opportunities such as Proposed Plans for Category 4 sites or well field design presentations or annual report reviews for Category 3 sites.



3.0 Report Organization

This report generally follows the report template found in the EPA guidance, with certain modifications made to accommodate the over eighty individual sites in numerous operable units found on the overall MMR Superfund Site. All requirements of the review were implemented for all the sites, while maintaining the integrity and continuity of the overall five-year review process. Tables and maps are provided throughout the report to create a user-friendly way to present information about the history and protectiveness of the cleanup actions taken at these multiple sites.

3.1 Requirements

According to the EPA guidance, the five-year review must, for each Site:

- *describe the Site's **chronology** and **background**,*
- *summarize the **remedial actions** that have taken place at the Site,*
- *describe the **progress** in the CERCLA cleanup process that has taken place at the Site **since the last review** (if applicable),*
- *outline the actual five-year review **process** conducted on the Site,*
- *do a **technical assessment** of the Site,*
- *describe any **issues** arising from the review process,*
- *make **recommendations** and **follow-up actions** needed at the Site, and*
- *provide a **statement of protectiveness** for the Site.*

3.2 Report Layout

To this point in the report, there have been general discussions of how the five-year review requirement came to be, how the review is being conducted at the MMR Superfund Site, and what the specific requirements of the report are. What follows is a short description of the Community Involvement activities associated with this report (Section 4). Then the technical report begins at Section 5, with a short description of the overall MMR Superfund Site and then continues following the list of requirements described in Section 3.1, above.

Using the tables and maps provided, the reader may jump directly to specific sites by name, category, or geographic location and then locate the review information for these sites within the report.

In Section 6, a summary table (Table 1) lists each site by its site identifier code (site ID) and name, its category, the location of the information about each site within the report, and a reference to the latest CERCLA documentation. Maps that provide a visual reference to the sites follow the summary table. A single, regional map locates all the sites, both on and off the installation (Figure 4) and the next four maps identify and locate all the sites within an individual town (Figure 5, Figure 6, Figure 7, Figure 8).

To find a site from its location on a map, the reader will take the site ID (CS-10, FS-12, SD-5, etc.) from one of the maps and locate it on the summary table, which will then direct the reader to the appropriate section and page number within the report.

Following this general introduction, each of the four categories of sites will be presented in its own section, each with its own category summary table and category map. Category 1 sites are found in Section 7, Category 2 in Section 8, Category 3 in Section 9, and Category 4 in Section 10. Each category's summary table provides information about each site's **chronology, background, summary of remedial actions, progress since the last review,** and references to relevant CERCLA documentation. A regional map showing all the sites in the particular category follows the summary table. Following the map, there are detailed, stand-alone, **technical assessments** for those sites where a remedy was completed within the reporting period (1998-2002) or is still functioning. Currently available data were used to make these assessments of protectiveness. Any **issues** that arise as a result of these assessments will be documented, along with any **recommendations** and required **follow-up actions. Protectiveness statements** will be made for each of the sites, either as a category-wide summary declaration or as site-specific statements. The report is summarized with a list of issues, the required follow-up actions, and the methodology for tracking these actions (Section 11) and ends with an overall statement regarding the protectiveness of the MMR IRP remedies (Section 12).

4.0 Community Involvement

The community was invited to provide input to AFCEE during the period the five-year review report was being prepared. Public meeting announcements, news releases, and the full capability of the MMR IRP community involvement program was brought to bear to inform the public of their opportunity to contribute to the report. At the time of the publishing of this report, no specific public comments were received.

The public will have the opportunity to review the document after it is prepared. Any issues raised by this review will be addressed in any of the available public meetings. The Plume Cleanup Team (PCT) was briefed on July 10, 2002 and again on January 8, 2003, and the Senior Management Board (SMB) was briefed on July 24, 2002. Informal comments were received and incorporated into the draft. Site-specific issues remaining open will be either integrated into the appropriate, currently-open project pertaining to that particular site. If there are issues that do not pertain to a site currently being discussed, then new action items will be opened to address and track the resolution of these issues, again using the appropriate public meeting forum. (Refer back to Figure 3 to see visually how the community involvement process works.)

5.0 Site Location and Description

The MMR Superfund Site is located on western Cape Cod in Barnstable County, Massachusetts, approximately 60 miles south of Boston and immediately southeast of the Cape Cod Canal. It occupies approximately 22,000 acres within the towns of Bourne, Falmouth, Mashpee and Sandwich. The MMR is organized into four principal functional areas:

> ***Range Maneuver and Impact Area.*** *This 14,000-acre area occupies the northern 70% of MMR and is used for training and maneuvers.*

Cantonment Area. *This 5,000-acre area in the southern portion of MMR, is the location of administrative, operational, maintenance, housing, and support facilities for the base. This is the most actively used section of MMR. The Otis ANG Base Facilities, including the flight line, area in the southeast portion of the Cantonment Area. The US Coast Guard Air Station Cape Cod shares the flight line with Otis ANGB and has its own facilities to support its flying mission.*

Massachusetts National Cemetery. *This area consists of 750 acres along the western edge of MMR and contains the Veterans Administration cemetery and support facilities.*

Cape Cod Air Force Station. *This area occupies 101 acres of the northern portion of the Range Maneuver and Impact Area and consists of a fixed base phased array warning system known as PAVE PAWS.*

5.1 Land Use and Site History

Although military activity began at MMR as early as 1911, most operations have occurred since 1935 and have consisted of two general types: (1) mechanized Army training and maneuvers and (2) military aircraft operations, maintenance, and support. Intensive Army activity occurred with the onset of World War II and continued through demobilization following the war (1940-1946). Major aircraft operations associated with surveillance and air defense occurred from 1955 to 1970. Although aircraft operations continue today, the greatest potential for release of contaminants to the environment was between 1940 and 1970. Tenants at MMR include, or have included, the U.S. Coast Guard (Air Station Cape Cod), Army National Guard (Camp Edwards), U.S. Air Force (USAF) (Cape Cod Air Force Station), Air National Guard (Otis Air National Guard Base), Veterans Administration National Cemetery, U.S. Marine Corps, U.S. Department of Agriculture, and the Commonwealth of Massachusetts.

Activities at MMR that have the potential for contaminating the environment have included the storage, handling, and disposal of solvents and petroleum fuels as well as the leakage of these materials into storm water drainage systems and the sanitary sewer system. Landfill operations, firefighter training, coal and ash storage, sewage treatment, and numerous chemical and fuel spills have also resulted in environmental contamination.

6.0 Report Summary

6.1 Maps

The reader should start with the maps (Figure 4, Figure 5, Figure 6, Figure 7, Figure 8) to begin gathering information about specific sites. The first map (Figure 4) shows all sites (source areas and plumes) within the MMR IRP program that have been reviewed in this report. The next four maps (Figures 5-8) show the sites located in each of the four towns (Bourne, Falmouth, Mashpee, Sandwich). Note that part of each town's real estate actually lies inside the MMR installation boundary. This land is under the control of the military and is considered "on-base."

6.2 Summary Table

The next level of information is the summary table (Table 2), where exhaustive background information for this report is available as references. All these documents, as well as those referenced in the later tables, and technical assessments, can be found in the MMR Administrative Record (see section 2.2, above). The essence of this information has been summarized in the tables that accompany each category, and more detailed information can be found about the Category 2, 3, and 4 sites in the technical assessments and site discussions contained in their respective sections.

6.3 Site Groupings, Names, Numbers, Status

Certain sites were grouped together or renamed, based on the way they were handled in the CERCLA cleanup process. This was done because certain sites were located close to one another -- even though they were often discovered independently -- and they wound up being cleaned up, and therefore documented, under a single action. The documentation for these sites reflects these groupings. In addition, there are exceptions regarding site names, numbering, etc. that require an explanation. Table 1 is a summary of these exceptions and groupings.

Table 1. Site Groupings, Names, Numbers, Status

SITE OR SITES	EXPLANATION
CS-4, FS-1(CG)	These source areas are grouped by location.
CS-10, Details A through I	Each "detail" is an individual source area within the overall CS-10 source area.
CS-10, Tank Wash OU	This is handled as a separate CS-10 source area.
CS-13 **(not listed at all)**	This site was removed from the MMR Federal Facility Agreement by the 6/11/02 Amendment.
CY-4, FTA-3, SD-3	These source areas are grouped by location.
FS-5, SD-5	These source areas are grouped by location.
FS-6, FS-8, SD-2	These source areas are grouped by location.
FS-10, FS-11, PFSA	These source areas are grouped by location.
FTA-2, LF-2	These source areas are grouped by location.
FS-24 **(not separately listed)**	This source area is included with the CS-10 (Details A-I) source areas as "Detail G."
PFSA	Petroleum Fuel Storage Area (Source Area)
DDOU	Drum Disposal Operable Unit (Source Area)
AV	Ashumet Valley Ground Water Plume
EB	Eastern Briarwood Ground Water Plume
WA	Western Aquafarm Ground Water Plume

6.1 Site Overview Maps

Placeholder for:
FIGURE 4:
MAP OF ALL MMR SITES

Placeholder for:
FIGURE 5:
MAP - SITES IN THE TOWN OF BOURNE

Y:\Figures\179636\5_Year_Review\GIS\20030429\Arcmap\5yr_03_Falplumes_Fig6.mxd

LF-1
CS-23
Route 28
MMR Boundary
Route 151
CS-20
CS-21
CS-4
FS-29
Ashumet Pond
Falmouth
FS-28
Deep Pond
Little Jenkins Pond
Frog Pond
Round Pond
Coonamessett Pond
Ashumet Valley
Crooked Pond
Thomas B. Landers Road
Shallow Pond
Ashumet Valley
Round Pond
Jenkins Pond
Pond 14
Flax Pond
Mare Pond

Legend

- Bordering Towns
- Plume Upwelling
- Town Boundary
- MMR Boundary
- EDB Plume Contour = Represents an exceedance of Ethylene dibromide (1,2-dibromoethane) (EDB MCL = 0.02 µg/L)
- TCE Plume Contour = Represents an exceedance of Trichloroethene (TCE) (TCE MCL = 5.0 µg/L)

Note: No Source Areas within the Town of Falmouth

N

0 2,000 Feet

Scale 1:24,000

Air Force Center for Environmental Excellence

Sites within the Town of Falmouth

Massachusetts Military Reservation
Cape Cod, Massachusetts

NAME: jpiccuito DATE: 1/20/2003

Figure 6

Placeholder for:
FIGURE 7:
MAP - SITES IN THE TOWN OF MASHPEE

Placeholder for:

FIGURE 8:

MAP - SITES IN THE TOWN OF SANDWICH

Table 2.-- Summary of MMR Five Year Review (1998-2002)

SITE ID	SITE INFO	CAT 1: No Further Action[1]	CAT 2: Remedy Complete[2]	CAT 3: Remedy Functioning[3]	CAT 4: Under Investigation[4]	Location in Report[5]	REMARKS
AV[6]	Ashumet Valley (Ground Water)			G		Section 9.3.1	Interim Record of Decision, September 1995; Plume Response Decision, September 1997; AV Axial 2000 Annual SPEIM, March 2002
CS-1		S				*Section 7.2, Table 3*	Decision Document, December 1999
CS-1	CG			S		Section 9.3.2	ROD, Sep. 1995; Post-ROD Change, April 2001; Comprehensive LTM Plan, June 2002
CS-2		S				*Section 7.2, Table 3*	Decision Document, October 2000
CS-2	CG	S				*Section 7.2, Table 3*	Decision Document, November 2000
CS-3		S				*Section 7.2, Table 3*	Decision Document, April 2001
CS-3	CG	S				*Section 7.2, Table 3*	ROD, September 1998
CS-4	Source			S		Section 9.3.3	Action Memorandum, January 2002; Await CS-4 RAR
CS-4	Ground Water			G		Section 9.3.4	ROD, February 2000; LTM Data Transmittal, January 2002
CS-4	CG			S		Section 9.3.5	Action Memorandum Addendum, February 2003; Await Priority 2 & 3 RAR
CS-5				S		Section 9.3.6	Action Memorandum Addendum, February 2003; Await Priority 2 & 3 RAR
CS-5	CG	S				*Section 7.2, Table 3*	Decision Document, August 1990
CS-6		S				*Section 7.2, Table 3*	Decision Document, March 2001
CS-6	CG	S				*Section 7.2, Table 3*	Decision Document, June 2000
CS-7		S				*Section 7.2, Table 3*	Decision Document, August 1990
CS-7	CG	S				*Section 7.2, Table 3*	Decision Document, August 1990
CS-8		S				*Section 7.2, Table 3*	Decision Document, October 2000
CS-8	CG			S		Section 9.3.7	Engineering Evaluation/Cost Analysis May 2002; Action Memorandum August 2002
CS-9		S				*Section 7.2, Table 3*	Decision Document, June 1998
CS-10[7]	Source Areas: Details A thru I			S		Section 9.3.8	ROD July 1999; ESD January 2003; Await CS-10/FS-24 RAR
CS-10[7]	Source: Tank Wash OU	S				*Section 7.2, Table 3*	Decision Document, February 1990
CS-10[8]	Ground Water			G		Section 9.3.9	Interim Record of Decision, September 1995: 3 Systems: In-Plume; Sandwich Road; South & Southwest ETR Systems; Combined SD-5 & CS-10 2001 SPEIM, July 2002
CS-11				S		Section 9.3.10	Action Memorandum Addendum, February 2003; Await Priority 2 & 3 RAR
CS-12	VA	S				*Section 7.2, Table 3*	Decision Document, August 1990
CS-14		S				*Section 7.2, Table 3*	Decision Document, July 2000
CS-15		S				*Section 7.2, Table 3*	Decision Document, December 2001
CS-16				S		Section 9.3.11	ROD May 1999, ESD January 2003, RAR September 2002
CS-17				S		Section 9.3.11	ROD May 1999, ESD January 2003, RAR September 2002
CS-18					S	Section 10.3.1	Final CS-18 SSI Technical Memorandum, Anticipated November 2002
CS-19	Source				S	Section 10.3.2	Draft Final CS-19 RI, March 2002
CS-19	Ground Water				G	Section 10.3.3	Draft Final CS-19 RI, March 2002
CS-20	Ground Water (source unknown)			G		Section 9.3.12	ROD, February 2000, treatment systems in design
CS-21	Ground Water (source unknown)			G		Section 9.3.13	ROD, February 2000, treatment systems in design
CS-22				S		Section 9.3.14	Action Memorandum, May 2002; Await CS-22 RAR
CS-23	Ground Water (source unknown)				G	Section 10.3.4	Under Investigation
CY-1		S				*Section 7.2, Table 3*	Decision Document, January 2003
CY-2		S				*Section 7.2, Table 3*	Decision Document, October 1988
CY-3		S				*Section 7.2, Table 3*	Decision Document, January 2003
CY-4				S		Section 9.3.15	ROD, September 1998; ESD January 2003; Awaiting 6 AOC RAR
DDOU	Drum Disposal Operable Unit			S		Section 9.3.16	Action Memorandum Addendum, February 2003; Await Priority 2 & 3 RAR
EB[9]	Eastern Briarwood (Ground Water)			G		Section 9.3.17	Interim Record of Decision, September 1995; 5th Annual Comprehensive Report; EB & WA Groundwater Monitoring Report, January 2002
FS-1	Source	S				*Section 7.2, Table 3*	ROD, April 2000; Quashnet River and Bogs 2001 SPEIM
FS-1	Ground Water			G		Section 9.3.18	ROD, April 2000; Wellfield Design Report
FS-1	CG			S		Section 9.3.5	Action Memorandum Addendum, February 2003; Await Priority 2 & 3 RAR
FS-2		S				*Section 7.2, Table 3*	ROD, February 2002
FS-2	CG	S				*Section 7.2, Table 3*	Decision Document, December 1999
FS-3		S				*Section 7.2, Table 3*	Decision Document, May 1997
FS-4				S		Section 9.3.19	Action Memorandum, June 1999; Await Priority 2 & 3 RAR
FS-5				S		Section 9.3.20	ROD, September 1998; ESD January 2003; Awaiting 6 AOC RAR
FS-6				S		Section 9.3.21	ROD, September 1998; ESD January 2003; Awaiting 6 AOC RAR
FS-7				S		Section 9.3.22	Action Memorandum Addendum, February 2003; Await Priority 2 & 3 RAR
FS-8				S		Section 9.3.21	ROD, September 1998; ESD January 2003; Awaiting 6 AOC RAR
FS-9			S			Section 8.3.1	ROD, June 1999; ESD January 2003; RAR September 2002
FS-10				S		Section 9.3.23	ROD, September 1998; ESD January 2003; Awaiting 6 AOC RAR
FS-11				S		Section 9.3.23	ROD, September 1998; ESD January 2003; Awaiting 6 AOC RAR
FS-12	Source			S		Section 9.3.24	Removal Action Summary Report, March 2000
FS-12	Ground Water			G		Section 9.3.25	Interim Record of Decision, September 1995; Draft 2001 Annual SPEIM April 2002
FS-13	Source				S	Section 10.3.5	Under Investigation
FS-13	Ground Water			G		Section 9.3.26	ROD, February 2000; LTM Data Transmittal, January 2002
FS-14		S				*Section 7.2, Table 3*	Decision Document, April 2000
FS-15		S				*Section 7.2, Table 3*	Decision Document, August 1990
FS-16		S				*Section 7.2, Table 3*	Decision Document, August 1990
FS-17		S				*Section 7.2, Table 3*	Record of Decision, Octiober 1999
FS-18				S		Section 9.3.27	Action Memorandum Addendum, February 2003; Await Priority 2 & 3 RAR
FS-19		S				*Section 7.2, Table 3*	ROD, October 1999
FS-20		S				*Section 7.2, Table 3*	Decision Document, February 1990
FS-21		S				*Section 7.2, Table 3*	Decision Document, October 2000
FS-22		S				*Section 7.2, Table 3*	Decision Document, March 2000
FS-23		S				*Section 7.2, Table 3*	Decision Document, April 2000
FS-24[7]				S		Section 9.3.8	See CS-10 Details A thru I (above)
FS-25		S				*Section 7.2, Table 3*	Decision Document, March 1997
FS-26	CG	S				*Section 7.2, Table 3*	Decision Document, July 1997
FS-27		S				*Section 7.2, Table 3*	Decision Document, December 1997
FS-28	Ground Water (source unknown)			G		Section 9.3.28	ROD, October 2000; 2000 Annual SPEIM, October 2001
FS-29	Ground Water (source unknown)			G		Section 9.3.29	ROD, October 2000; 2000 Annual SPEIM, October 2001
FTA-1			S			Section 8.3.2	Final Closure Report, July 2000
FTA-2				S		Section 9.3.30	ROD, September 1998; ESD January 2003; Soil Vapor Extraction System
FTA-3				S		Section 9.3.15	ROD, September 1998; ESD January 2003; Awaiting 6 AOC RAR
LF-1	Source			S		Section 9.3.31	ROD Interim Remedial Action January 1993; Comprehensive LTM Plan, June 2002
LF-1	Ground Water			G		Section 9.3.32	Interim Record of Decision, 1995; Plume Response Report, 1997, LF-1 2001 SPEIM, July 2002
LF-1	CG	S				*Section 7.2, Table 3*	Decision Document, December 1995
LF-2				S		Section 9.3.30	ROD, September 1998; ESD January 2003; Soil Vapor Extraction System
LF-2	CG	S				*Section 7.2, Table 3*	Decision Document, May 1991
LF-3		S				*Section 7.2, Table 3*	Decision Document, April 1997
LF-3	CG	S				*Section 7.2, Table 3*	Decision Document, May 1991
LF-4		S				*Section 7.2, Table 3*	Decision Document, November 2000
LF-5	VA	S				*Section 7.2, Table 3*	Decision Document,August 1990
LF-6		S				*Section 7.2, Table 3*	Decision Document, August 1990
LF-7				S		Section 9.3.33	Decision Document, November 1993; Annual Radiological Monitoring, July 29, 2002
PFSA	Petroleum Fuel Storage Area			S		Section 9.3.23	ROD, September 1998; ESD January 2003; Soil Vapor Extraction System
SD-1		S				*Section 7.2, Table 3*	Decision Document, February 2000

Table 2.-- Summary of MMR Five Year Review (1998-2002)

SITE ID	SITE INFO	CAT 1: No Further Action[1]	CAT 2: Remedy Complete[2]	CAT 3: Remedy Functioning[3]	CAT 4: Under Investigation[4]	Location in Report[5]	REMARKS
SD-2				S		Section 9.3.21	Record of Decision (ROD) September 1998; ESD January 2003; Awaiting 6 AOC RAR
SD-3				S		Section 9.3.15	ROD, September 1998; ESD January 2003; Awaiting 6 AOC RAR
SD-4				S		Section 9.3.34	ROD, September 1998; ESD January 2003; Ecological Risk Evaluation
SD-5[10]	Source			S		Section 9.3.20	ROD, September 1998; ESD January 2003; Soil Vapor Extraction System
SD-5	North & South Ground Water			G		Section 9.3.35	Interim Record of Decision, 1995; Combined SD-5 & CS-10 2001 SPEIM, July 2002
WA[11]	Western Aquafarm (Ground Water)			G		Section 9.3.36	Interim Record of Decision, September 1995; 5th Annual Comprehensive Report; EB & WA Groundwater Monitoring Report, January 2002

G shaded entries are ground water sites (plumes)

NOTES:

[1] The site has been through the CERCLA cleanup process through one or more of the investigation phases and subsequently closed without implementing a remedy. There is an approved decision document allowing unrestricted land use.

[2] The site has been through the CERCLA cleanup process through one or more of the investigation phases, a remedial decision was made, and an approved remedy was implemented. The remedial action proceeded through site cleanup and the site was subsequently closed. There is an approved decision document allowing unrestricted land use.

[3] The site has been through the CERCLA cleanup process through one or more of the investigation phases, a decision was made, and an approved remedy is pending or has been implemented. The remedial action continues to function and the site remains open. For the purposes of this category, if the mechanical system has been shut down but land use or other institutional controls remain in effect, the remedy is considered "still functioning."

[4] The site is currently under investigation. There is currently neither a complete risk characterization nor a decision regarding the possible remediation of the site.

[5] The section or table number where additional information about each particular site can be found within the report.

[6] For the purposes of this program, the sources for the Ashumet Valley ground water plume are considered to be a comingling of the phosphorus contamination from sites CS-16 and CS-17 and the volatile organic solvents from the FTA-1 site. There is a ground water treatment system on the solvents plume and the remedial solution for the phosphorus plume is currently under investigation, in conjunction with the on-going phosphorus studies in Ashumet Pond.

[7] For the purposes of this program, nine sites are considered source areas for the CS-10 ground water plume. These are labeled "Detail A" through "Detail I" in the documentation. FS-24 is also included with these source areas as Detail G.

[8] There are three separate ground water treatment systems currently operating on the CS-10 ground water plume. In addition, treatment options are currently being investigated for the "leading edge" area of the plume.

[9] For the purposes of this program, the sources for the Eastern Briarwood ground water plume are the FS-25, SD-4, and CS-14 sites.

[10] The first remediation action for the SD-5 source area, soil excavation, is complete. A second remediation decision, expected around the time this report is published, is being made to install an SVE system. This site is therefore being carried under "Remedy Functioning" rather than "Under Investigation."

[11] For the purposes of this program, the sources for the Western Aquafarm ground water plume are the SD-5 and FTA-2 sites.

7.0 Category 1 Sites, No Further Action

7.1 Map

All sites in this category may be found on the regional map at Figure 9.

7.2 Data Summary Table

All the data and protectiveness assessment information for the Category 1 sites (No Further Action) are found in the Category 1 Sites Data Summary Table (Table 3). These sites were closed following their investigation phase and therefore no cleanup remedy was ever selected; therefore, no additional, site-specific analyses were required.

7.1 Category 1 Map

Placeholder for:
FIGURE 9:
MAP - CATEGORY 1 SITES

Table 3.-- Category 1 Sites (No Further Action) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
CS-1	Chemical Spill 1	Phase 1 Records Search performed by E.C. Jordan Co. in 1986. An SI was done in 1993 and confirmation sampling was done in 1995 and 1999.	CS-1 includes the former location of four U.S. Army regimental motor pools. The motor pools, active from 1941 to 1946, consisted of 11 buildings and 11 gas stations.	43 of 49 drainage structures were identified and removed as part of the DSRP. The remaining six structures were assumed to have been removed during the Runway A expansion.	The CS-1 Final Final Decision Document was completed in September 1999. USEPA and MADEP provided concurrence in December 1999.	None
CS-2	Chemical Spill No.2 East Truck Motor Pool	SI completed in 1996	CS-2 designates the location of three former Army regimental motor pools. Contaminants may have been released to the environment as a result of maintenance activities and spills.	As part of the DSRP, foundation slabs, work pits, and catch basins were removed.	Final Decision document for No Further Action was completed in October 2000. USEPA and MADEP provided concurrence in November 2000.	None
CS-2CG	U.S. Coast Guard Chemical Spill No.2 Study Area	SI completed in 1999	CS-2 consists of USCG Air Station hangers 3170 and 3172, a former auto hobby shop, a former ground support shop, and administrative buildings. Contaminants may have been released to the environment as a result of maintenance activities, spills , and disposal practices.	None	No Further Action Decision Document completed in November 2000. USEPA and MADEP provided concurrence in November 2000.	None
CS-3	South Truck Road Motor Pool	SI completed in 1992. Groundwater sampling conducted in 1999.	Study Area CS-3 was the former South Truck Road Motor Pool which operated from 1940 to 1973. CS-3 was also used as a base for the Engineering Roads and Grounds Department.	Six MOGAS USTs were decommissioned and removed from the CS-3 Study Area. Six leaching wells were removed from CS-3 as part of the DSRP.	Final Decision document for No Further Action completed in April 2000 and approved in June 2000 by USEPA and July 2000 by MADEP.	None
CS-3CG	United States Coast Guard Chemical Spill No. 3	SI Completed in 1996. RI completed in 1997. Proposed Plan presented in 1998	CS-3 occupies 3.5 acres in the south central portion of the MMR. USTs were removed at the site. Sampling results of the RI recommended NFA.	USTs removed and sediment and sludge removed as part of the DSRP	No Further Action documented in ROD, IRP Record of Decision AOC CS-3 (USCG) "3 in 1 Store" MMR, Finalized and approved by the USEPA and MADEP in September 1998.	None
CS-5CG	United States Coast Guard Chemical Spill No. 5 Carpentry Shop	Preliminary Assessment completed in 1986.	The carpentry shop located in Building 3456 has operated since 1970. Waste thinner may have been spilled.	None	No further Action documented in Decision Document for 11 Study Areas Massachusetts Military Reservation Installation Restoration Program August 1990. USEPA and MADEP approval were received in May 1991 and July 1991 respectively.	None

Table 3.-- Category 1 Sites (No Further Action) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
CS-6	Chemical Spill Site No. 6	SI completed in 1996.	Study Area CS-6 included a former oil/water separator, a leaching well, and paved areas draining to drainage structures or site perimeters.	Leaching well was removed from service in 1989.	No further Action documented in Decision Document for Chemical Spill Site (CS-6)/Fuel Spill Site (FS-22) March 2000, approved by the USEPA and MADEP April 2000	None
CS-6CG	United States Coast Guard Chemical Spill No. 6	SI completed in 1991	CS-6 consists of the USCG Building 5215 which houses maintenance shops. Spills of solvents, oil, and hydraulic fluid occurred. A 2,000 gallon UST and two ASTs were located at the site.	Petroleum-contaminated soil associated with ASTs was removed in 1990. In May 1993, the UST was removed.	Final Decision document for No Further Action completed in April 2000. USEPA and MADEP provided concurrence in June 2000.	None
CS-7	Operational Motor Pool OMS-6 Chemical Spill -7	Preliminary Assessment completed in 1989	Operational Pool used as vehicle maintenance shops between 1966 and 1974. Until 1985, battery acid was neutralized and discharged to the sanitary sewer.	None	Not Applicable	No Further Action documented in Decision Document for 11 Study Areas at MMR IRP, August 1990. USEPA and MADEP provided concurrence in May 1991 and July 1991 respectively.
CS-7CG	United States Coast Guard Chemical Spill No. 7 Dry-Cleaning Facility	Preliminary Assessment completed in 1986.	CS-7CG was a dry-cleaning facility that operated between the 1960's and 1975 at Building 1131. Since 1975, the dry-cleaning machines have been non-operational.	None	Not Applicable	No Further Action documented in Decision Document for 11 Study Areas at MMR IRP, August 1990. USEPA and MADEP provided concurrence in May 1991 and July 1991 respectively.
CS-8	Chemical Spill No.8; Organizational Maintenance Shop 22	Site Investigation completed in 1988.	Study CS-8 includes an active and an abandoned concrete washpad, a cesspool, and a 12,500 gallon diesel-fuel UST and pump island. Battery electrolyte had been discharged to the cesspool until 1985.	None	No Further Action Decision Document Study Area CS-8/FS-21 was completed in October 2000. USEPA and MADEP approval was provided in November 2000.	None
CS-9	Chemical Spill No. 9 Former Main USAF Motor Pool	RA Summary Report completed in 1994.	Study Area CS-9 is a former motor pool located on the northeast side of Connery Avenue. The northern end of CS-9 contains a bicycle motorcross (BMX) racetrack used by surrounding communities.	Three USTs associated with a MOGAS refueling system was removed in 1985. Additional soil was excavated in 1994. Approximately 3,663 tons of soil was treated in a low-temperature thermal treatment unit (TTU) in 1995.	No further action documented in MMR Decision Document Program Study Area CS-9, Final, June 1998. USEPA and MADEP approval were received in December 1997 and May 1998 resepectively.	None

Table 3.-- Category 1 Sites (No Further Action) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
CS-10 Tank Wash Operable Unit	Chemical Spill No. 10 Former Tank Washing Station	Phase 1 Records Search performed by E.C.. Jordan Co., in 1986, and Field Investigation Program conducted by E.C. Jordan Co., 1988 through 1989.	The currently operating tank wash facility for tracked vehicles and heavy trucks at site CS-10 began operation in 1983. Washwater is fed to an oil/water separator. Effluent from the separator drains to a ditch just south of the washing platform. A permit to discharge this effluent to the ground was issued by the state of Massachusetts in August 1986.	None	Not Applicable	No further action documented in Decision Document Site CS-10 Tank Wash Operable Unit, February 1990. USEPA and MADEP approvals were received on May 1991 and July 1991 respectively.
CS-12VA	Vetrans Administration Cemetery Roads and Grounds Shop (Study Area CS-12)	Preliminary Assessment completed in 1989	The Veteran's Administration roads and grounds shop has operated since 1980. Vehicle maintenance and pesticide mixing were conducted at the site. A PA was performed in 1989. NFA was recommended based on results of the PA.	None	Not Applicable	No further Action documented in Decision Document for 11 Study Areas at MMR IRP, August 1990. USEPA and MADEP provided concurrence in May 1991 and July 1991 respectively.
CS-14	Chemical Spill No. 14 Building 156 Leach Pit	SI completed in 1993, Supplemental sampling completed in 1999	CS-14 included a vapor degreasing leaching pit located at Building 156 and an abandoned oil/water separator installed in 1989. CS-14 was evaluated because the vapor-degreaser-leaching pit was identified as a potential source of contamination.	DSRP activities included decontamination of oil/water separator and discharge manhole and fill with concrete.	No Further Action Decision Document Study Area Chemical Spill CS-5 completed in April 2000 and approved by USEPA and MADEP in June 2000.	None
CS-15	Chemical Spill No. 15	SIs conducted in 1989, 1990 and 1993. SSI completed in 1995. No Further Action Decision Document signed in December 2001.	CS-15 is a former jet engine testing site utilized from 1949 until 1985. This study area consists of former Building 202, an outside testing stand; former Building 204, an enclosed testing stand; and the area surrounding these buildings.	None	No Further Action Decision Document Study Area CS-15, finalized July 2001 and approved by USEPA and MADEP December 2001.	None
CY-1	Coal Yard -1 Former Coal Yard Storage Area	Phase 1 Records Search performed by E.C. Jordan Co., in 1986	A former U.S. Army coal storage area used from 1940 to 1957. When in use, coal was unloaded from railroad cars and stockpiled at the site. The coal was then transported to individual power plants on MMR.	None	No Further Action Decision Document completed in June 2002. Approved by USEPA and MADEP January 2003.	None
CY-2	Coal Yard -2 Former United States Air Force/Air National Guard Coal Yard Storage Yard	Phase 1 Records Search performed by E.C. Jordan Co., in 1986, SI completed in 1988.	Coal was stockpiled at CY-2 from 1957 to 1984. Most of the coal on a bituminous paved surface.	None	Not Applicable	No Further Action Decision Document completed in October 1988. Massachusetts Department of Environmental Quality Engineering concurrence dated January 1989.

Table 3.-- Category 1 Sites (No Further Action) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
CY-3	Coal Yard-3, Former Veterans Administration Hospital coal yard	Phase 1 Records Search performed by E.C. Jordan Co., in 1986	CY-3 is located at the former VA hospital steam plant, which operated from 1945 to 1972. Coal was stored on an unbermed, paved pad before transfer to hopper bins. Coal ash was stored temporarily in an onsite pit.	None	No Further Action Decision Document completed in June 2002. Approved by USEPA and MADEP January 2003.	None
FS-1	Fuel Spill 1 (Source)	1983, Phase I records search. 1985, Phase II investigation. 1989, an SI was performed in the source area. 1990, initial RI completed on source area and groundwater. 1993, 1995, & 1998-9 additional groundwater and soil sampling efforts were conducted.	AOC FS-1 was used by the 551st Airborne Early Warning and Control Wing to test fuel dump valves between 1955 and 1970. Records searches indicate that aircraft fuel valves were tested by being opened and the fuel allowed to drain. The exact quantity of fuels released is unknown.	April 1999, FS-1 Pilot Test Project began operation. This leading edge system includes 175 shallow extraction well points (with 95 currently being operated), one deep EW, a treatment system building (2 GACs) and a shallow re-injection trench.	No Further Action Record of Decision for Area of Contamination FS-1, April 2000. USEPA and MADEP provided concurrence in May 2000.	See Category 3 for FS-1 Plume.
FS-2	Fuel Spill No. 2 Railroad Fuel Station	Supplemental RI completed in January 2001. Removal Action performed in 1996.	AOC FS-2 consists of 5.5 acres of land located at the end of Guenther Road, adjacent to the southern boundary of the MMR golf course. From 1955 to 1965, the site was used to operate a petroleum unloading and transfer station. AVGAS and JP-4 were unloaded from railroad tank cars and tanker trucks and conveyed to the PFSA.	Petroleum-contaminated soil was excavated and treated at the thermal treatment plant at FTA-1 in 1991 removal action.	Final ROD for Area of Contamination Fuel Spill-2 was completed in February 2002. USEPA approved the ROD on February 7, 2002. MADEP provided concurrence letter on February 5, 2002.	None
FS-2CG	United States Coast Guard Fuel Spill No. 2; Hot Asphalt Plant	SI completed in 1993, Supplemental sampling completed in 1995.	FS-2 CG was located in the vicinity of Buildings 3458 and T-3454 near Turpentine Road. As part of the asphalt-batching operations, an estimated 8,000 gallons of fuel was spilled.	None	Final Decision document for No Further Action completed in December 1999, and approved by the USEPA in January 2000 and approved by MADEP February 2000	None
FS-3	Fuel Spill No. 3; Johns Pond Fuel Dump	SI completed in 1990.	Study Area FS-3 consists of a 1,500 ft section of Back Road and the area within approximately 50 feet of either side of the road. Between 1955 and 1962, fuel or fuel-contaminated water was drained onto the study area by refueler trucks to facilitate maintenance.	None	No further action documented in MMR Decision Document, Study Area FS-3, Johns Pond Road Fuel Dump Site, Final May 1997. USEPA and MADEP concurrenced received July 1998 and January 2000 respectively.	None

Table 3.-- Category 1 Sites (No Further Action) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
FS-14	Fuel Spill No. 14; Range E-3 Fuel Spill	Site Investigation completed in 1996.	FS-14 is located in Range E-3, on the north side of the Range Maneuver and Impact Area on the northern portion of MMR. FS-14 is the site of a MOGAS fuel spill of approximately 500 gallons that occurred in 1985.	30 cubic yards of petroleum contaminated soil excavated as a result of fuel spill in 1985.	Final Decision Document for No Further Action completed in April 2000 and approved in June 2000 by USEPA and MADEP.	None
FS-15	Runway No.5 Spill (Study Area FS-15)	Preliminary Assessment completed in 1986.	In the early 1960's, a plane crashed and burned at the end of Runway No.5, resulting in a spill approximately 200 gallons of aviation gasoline.	None	Not Applicable	No Further Action documented in Decision Document for 11 Study Areas at MMR IRP, August 1990. USEPA and MADEP provided concurrence in May 1991 and July 1991 respectively.
FS-16	Army Helicopter Maintenance, Building 2816 (Study Area FS-16)	Preliminary Assessment completed in 1986.	In 1982, a tanker truck spilled 200 gallons of JP-4. The spill occurred on tarmac ramp outside Building 2816.	None	Not Applicable	No Further Action documented in Decision Document for 11 Study Areas at MMR IRP, August 1990. USEPA and MADEP provided concurrence in May 1991 and July 1991 respectively.
FS-17	Former WWII Motor Pool/Fuel Transfer Point	RI completed in 1994	FS-17 is located west of LF-1 in the south-central potion of the MMR. A RI was completed in 1994 that included soil and groundwater characterization. Supplemental soil investigation was completed in 1997. Based on the findings and conclusions of the 1994 RI and 1998 supplemental soil investigations, NFA was required.	None	No Further Action Record of Decision Area of Contamination FS-17 and Area of Contamination FS-19, Final, October 1999. Approved by the USEPA and MADEP in December 1999.	None
FS-19	Fuel Spill -19 Former MOGAS Fuel Storage & Point	RI completed in 1994. Supplemental Soil Investigations completed in 1998.	AOC FS-19 was operated as a WWII vehicle fuel storage and distribution facility. In 1941, six 10,000 gallon USTs were installed. Between 1958 and 1965, these USTs were used to store hazardous waste. Based on the findings and conclusions of the 1994 RI and 1998 supplemental soil investigations, NFA was required.	In 1989, the USTs were removed.	No Further Action Record of Decision Area of Contamination FS-17 and Area of Contamination FS-19, Final, October 1999. Approved by the USEPA and MADEP in December 1999.	None
FS-20	Fuel Spill-20 Current Product Tank No. 88	Site Investigation completed in 1989.	FS-20 is a 12,500 gallon UST located adjacent to Building 2806. Sampling results of the SI recommended NFA.	None	Not Applicable	No Further Action Decision Document for Site FS-20 Current Product Tank No. 88 dated February 1990. USEPA and MADEP approval received May 1991 and July 1991 respectively.

Table 3.-- Category 1 Sites (No Further Action) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
FS-21	Fuel Spill-21 Current Product Tank	Site Investigation completed in 1997.	Study Area FS-21, southwest of the vehicle repair shop is the former location of CPT No. 9, a 5,000 gallon MOGAS UST.	In 1988, the UST was replaced with a double-walled tank.	No Further Action Decision Document Study Area CS-8/FS-21 was completed in October 2000. USEPA and MADEP approval was provided in November 2000.	None
FS-22	Fuel Spill-22 ANG Motor Pool	Site Investigation completed in 1996.	Study Area FS-22 is a drainage ditch located south of CS-6 into which a 4,500 gallon fuel spill discharged in 1984.	All free product was removed and contaminated soil was excavated.	No Further Action Decision Document for Chemical Spill Site (CS-6)/Fuel Spill Site (FS-22) completed in March 2000, approved by the USEPA and MADEP April 2000.	None
FS-23	The South Truck Road Spill Site	Site Investigation completed in 1992.	FS-23 is located northeast of Study Area CS-3 approximately 200 feet northwest of the intersection of South Truck Road and Simpkins Road. Approximately 1,000 gallons of JP-4 leaked onto the ground from one of the fuel line clean out valves.	During the fuel system upgrade in 1993, fuel lines were removed.	No Further Action Decision Document CS-3/FS-23 completed in April 2000 and approved in June 2000 by USEPA and July 2000 by MADEP.	None
FS-25	Fuel Spill No. 25 Building 167 Area Fuel Spill	Preliminary Assessment completed in 1990.	Study Area FS-25 consists of a parking area located immediately northeast of Building 167 on Izzea Street.	Parking lot upgrade revealed petroleum-stained soils. Soils were excavated and stored on Taxiway E. Approximately 100 cubic yards were treated as part of the thermal treatment of soils from AOC FTA-1 and CS-4.	Not Applicable	No Further Action Decision Document Fuels Spill Site 25 (FS-25), dated May, 2000. USEPA and MADEP approval received March, 1997 and October, 1996 respectively.
FS-26CG	United States Coast Guard Fuel Spill -26 Building 3444 Fuel Tank Area	Draft Site Investigation completed in 1995.	The study area is the former location of a 3000-gallon UST that contained No.2 heating oil.	In 1990, the USCG removed the UST.	Not Applicable	No Further Action Decision Document Study Area US Coast Guard Fuel Spill Site No. 26 dated July 1997. USEPA and MADEP approval received March 1997 and May 1997 respectively.
FS-27	Fuel Spill No. 27 Connery Avenue Telephone Line Soil Excavation	Revised Draft SI Completed in 1995. Preliminary Risk Evaluation Letter completed in 1996.	Study area designates the location of soil stockpiled beneath the overhead power lines off Guenther Road at MMR.	None	Decision Document Study Area Fuel Spill 27 (FS-27) completed in December 2000. USEPA and MADEP approval received April 2001 and May 2001 respectively.	None

Table 3.-- Category 1 Sites (No Further Action) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
LF-1CG	Landfill 1 Coast Guard	Phase 1 Records Search performed by E.C. Jordan Co., in 1986. 1993, Priority 2 and 3 Study Areas Site Investigation. 1995, Decision Document Study Area LF-1 (USCG).	LF-1(CG) is located in the southeastern portion of MMR, north of the east-west runway, on the south side of Taxiway "Delta". LF-1(CG) is an area that was used for disposal of asphalt and debris generated during a runway extension project completed in the 1950s.	None	Not Applicable	No Further Action Decision Document Study Area LF-1(USCG), dated December 1995, was approved by the USEPA in September 1995 and by the MADEP in December 1995.
LF-2CG	Landfill 2 Coast Guard	A Phase 1 Records Search was done at this site in 1986. 1991, Decision Document for 11 Study Areas.	LF-2 is located north of the present BX service station. Only concrete blocks were dumped at this site. No evidence of hazardous material disposal was observed.	None	Not Applicable	No Further Action documented in Decision Document for 11 Study Areas at MMR IRP, August 1990. USEPA and MADEP provided concurrence in May 1991 and July 1991 respectively.
LF-3	Landfill-3 Northeast Landfill	A Phase 1 Records Search was done at this site in 1986.	LF-3 occupies less than one acre near the northeastern edge of the MMR. The entire area was wooded with the exception of sand piles. Debris such as concrete piles, lumber scraps, and old furniture was discarded at the study area. There was no evidence of potential hazardous material disposed of at the site.	In 1985, under the direction of the Facility Engineer, two 5-ton dump truck loads of debris was removed and taken to the main base landfill.	Not Applicable	No Further Action Decision Document Landfill 3, dated April 1997 was approved in March 1997 by USEPA and April 1997 by MADEP.
LF-3CG	Landfill 3 Coast Guard	A Phase 1 Records Search was done at this site in 1986. 1991, Decision Document for 11 Study Areas.	LF-3CG is located just south of the entrance to the USCG Transmitter Station. USCG is a demolition rubble and debris landfill which received sand and gravel excavated from the construction of a new dispensary building. No evidence of hazardous material disposal was observed.	None	Not Applicable	No Further Action documented in Decision Document for 11 Study Areas at MMR IRP, August 1990. USEPA and MADEP provided concurrence in May 1991 and July 1991 respectively.
LF-4	Landfill 4	A Phase 1 Records Search was done at this site in 1986. 1994, SERGOU RI Report. 2000, Final LF-4 Site Investigation Report. 2000, Decision Document for LF-4 Study Area.	LF-4 is located outside the eastern border of the MMR immediately south of the Otis ANG Base Ammunition Storage Area. The property was used for surface dumping of construction debris.	Approximately 1000 cubic yards was removed in 1998 under MADEP Administrative Consent Order (SD-98-4004). All waste was transported to the Mashpee landfill for disposal.	No Further Action Decision Document for Landfill-4 [LF-4] Study Area, dated November 2000 was approved by USEPA and MADEP in November 2000.	None

Table 3.-- Category 1 Sites (No Further Action) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
LF-5VA	Veterans Administration Landfill 5	A Phase 1 Records Search was done at this site in 1986.	Study Area LF-5 is located in the vicinity of the Veterans Administration Cemetery. It was used a debris and concrete rubble fill area. No evidence exists that hazardous materials were disposed of in this study area.	None	Not Applicable	No Further Action documented in Decision Document for 11 Study Areas at MMR IRP, August 1990. USEPA and MADEP provided concurrence in May 1991 and July 1991 respectively.
LF-6	Landfill 6	A Phase 1 Records Search was done at this site in 1986.	Study Area LF-6 is a former U.S. Navy (USN) landfill, located west of Runway 5. It was used as a debris and rubble fill area during expansion of the taxiway area and has since been paved over. Based on this reported use, no evidence of hazardous waste exists.	None	Not Applicable	No Further Action documented in Decision Document for 11 Study Areas at MMR IRP, August 1990. USEPA and MADEP provided concurrence in May 1991 and July 1991 respectively.
SD-1	Storm Drain 1	1986 Phase 1 Records Search. SIs were completed in 1989 and 1990. Decision Document signed in February 2000.	SD-1 is a 2,300 foot drainage ditch beginning at the southern side of the South Outer Road at the southern MMR boundary. Completed in 1960, the ditch is constructed of riprap blocks loosely fitted together, and is up to 200 feet wide and 6 to 10 feet deep. SD-1 is intended to convey overflow storm water from SD-5.	None	No Further Action Decision Document SD-1 Runway/Aircraft Maintenance Storm Drainage Ditch dated December 1997 and approved by USEPA in July 1998 and by MADEP in February 2000.	None

Notes:

1. “Site” column contains the Site Identifier (i.e. CS-1 CG). Sites with “Source” have groundwater contamination associated with them and denote the source area. Sites with “GW” denote groundwater contamination (i.e. plume). When neither “Source” nor “GW” follow the Site ID, then “Site” is assumed to be a source area only.
2. “Title” column contains the Site Name (i.e. Chemical Spill-1 Coast Guard)
3. “Site Chronology” column contains a brief listing of all major documents and the year of their finalization.
4. “Background” column contains a brief history of the site (i.e., site use and location).
5. “Construction/…” column contains a brief summary of all “cleanup” actions on the site including actions occurring during the report period.
6. “Progress Since last Five-Year Review” column contains a brief summary of IRP actions occurring during the report period.
7. “Remarks” column contains the document selecting the action on that particular site.

7.3 Category 1 Summary

The Five-Year Review requirements for these sites consisted of evaluating each site under Questions B and C. There was no remedy selected for Category 1 sites, therefore Question A is not applicable to them. Question B was evaluated for each of these sites, however, to assure that no changes had occurred to site conditions, maximum contaminant levels (MCL), exposure pathways or receptors during the reporting period. Question C was also considered for all Category 1 sites, to evaluate any new information that may have come to light for any site during the reporting period.

Summarizing the category, the assumptions used in the closure decisions are still valid and no new information came to light for any site during the reporting period; therefore, the decisions for all the Category 1 sites are still considered protective.

8.0 Category 2 Sites, Remedy Complete

8.1 Map

All sites in this category may be found on the regional map at Figure 10.

8.2 Data Summary Table

Data for the Category 2 sites are summarized in the Category 2 data summary table (Table 4). Because the remedies for all Category 2 sites were completed since the last five-year review, there are separate technical assessments for each site that were completed using the EPA guidance.

8.3 Technical Assessments

Technical assessments for the following Category 2 sites are stand-alone documents, with its own set of page numbers. Occasionally, a reference is made to a figure within the main document, such as a map.

8.3.1 Fuel Spill No.9 Source

8.3.2 Fire Training Area No.1 Source

These documents are shown in the next 15 pages.

8.3.1 FUEL SPILL NO. 9 (FS-9) SOURCE

A. BACKGROUND

A.1 Site Description

Fuel Spill-9 (FS-9) Current Product Tank 108 is located in the south central portion of the MMR (**Figure 10**). The site has been used for military vehicle maintenance. The site encompasses an area of approximately 7 acres and extends south a distance of approximately 720 ft from Building 1369 at the intersection of Beaman Road and West Truck Road to Building 1365. The paved portion of the site extends west a distance of approximately 120 ft, where it is bounded by undeveloped land. The developed portion of FS-9 was a motor pool that remained in service from World War II until 1986. Presently, the site includes five buildings (Buildings 1365, 1366, 1367, 1368, 1369) and a closed leaching well.

The undeveloped portion of AOC FS-9 is primarily a grassy or pine covered area. Storm sewer headwalls discharge west of the paved portion of the site into a drainage ditch. The drainage ditch leads to a depression west of the site. This depression has been classified as a vernal pool.

Suspected sources of contamination at FS-9 included USTs and activities associated with vehicle maintenance operations. The area is currently being used as a parking area for military vehicles.

A.2 Initial Responses

Prior to the finalization of the ROD, two non-CERCLA actions were conducted at FS-9 to address contamination. Summaries are provided below.

Fuel Upgrade Program: The USTs along with the fuel island, were removed as part of the Fuel Upgrade Program in 1994. The Fuel Systems Upgrade Report consisting of closure reports for CPT 106, 107, and 108 indicated that all contaminated soil was removed from the tank pits. (Metcalf & Eddy, 1994)

Drainage Structure Removal Program (DSRP): The waste disposal leaching wells and the catch basin were removed as part of the DSRP in 1996. Specifically, the catch basin and the leaching well adjacent to Building 1368 were removed and the leaching well adjacent to Building 1569 was abandoned in-place, following the removal of all wastes and decontamination of the structure using power-washing and steam-cleaning. Due to the location of the leaching well adjacent to Building 1369, this structure could not be removed because of structural concerns relative to the building. The structure adjacent to Building 1368 was removed along with 14 cubic yards of soil. Clean closure was achieved at the structure (AFCEE, 1999a).

A.3 Basis for Taking Action

Several studies were conducted at FS-9 to determine the nature and extent of contamination. Contaminants of concern (COCs) identified at FS-9 included total petroleum hydrocarbons (TPH), C_5 –C_8 aliphatic hydrocarbons, chromium, lead, vanadium, and zinc. Provided below is a summary of investigation activities that described a characterization of the site.

Remedial Investigation/ Feasibility Study: A RI was completed in 1998 (AFCEE, 1998a). FS-9 was divided into five areas: (1) the motor pool fueling island and USTs, (2) the leaching wells and catch basis, (3) the waste disposal area, (4) the drainage ditch/swale area, (5) the pond/wet area, which was determined to be a vernal pool. A Feasibility Study (FS) was completed in October 1998 (AFCEE, 1998b). Alternatives that received detailed analysis in the FS were:

1. No Action
2. Limited Action
3. Excavation/Asphalt Batching
4. Excavation/Asphalt Batching with Contingency Low Flow Vapor Extraction
5. Excavation/Offsite Treatment/Disposal
6. Excavation/Offsite Treatment/Disposal with Contingency Low Flow Vapor Extraction

B. REMEDIAL/REMOVAL ACTIONS:

This section presents the regulatory actions, removal action objectives (RAOs), remedy description, and a summary of the remedy implementation at FS-9.

B.1 Regulatory Actions

Described below are controlling documents that present the selected remedy and post-ROD documents that identified changes to the selected remedy.

Proposed Plan/Record of Decision: A proposed plan was issued by AFCEE in 1998 for public comment (AFCEE, 1998c). The proposed remedy (Alternative 6 in the FS) consisted of excavation of contaminated surface soil at three source areas [i.e., former underground storage tank (UST) location (CPT107/CPT108), the fence-line hot spot (SS1), and the TPH hot spot (TP-11)]; on-site cold-mix asphalt batching of recyclable excavated soil; off-site disposal of non-recyclable excavated soil; and post excavation confirmatory sampling to ensure that all soil with COC concentrations exceeding FS-9 soil cleanup levels were removed, implementation and maintenance of access restrictions, and 5-year reviews of remedy protectiveness at all three source areas. Furthermore, a contingency remedy to implement a Soil Vapor Extraction (SVE) treatment system if confirmation sampling indicates that subsurface soil contamination is beyond the practical limits of excavation at the tank pit area.

The ROD, finalized in June 1999, documented the selected remedy (AFCEE, 1999b). The selected remedy was not changed as a result of public comments received as part of the Proposed Plan process.

Pre-Design Sampling and Analysis Report: Confirmatory sampling was conducted at tank former UST location (CPT107/CPT108) as part of the SVE design to address TPH contamination at the subsurface (AFCEE, 2000a). Results indicate that subsurface contamination did not exist; therefore no further action was required at the tank former UST location (CPT107/CPT108).

Explanation of Significant Differences: An Explanation of Significant Differences (ESD) was prepared to document changes to the selected remedy for several sites in the Source Area Remedial Action Program (SARAP) including FS-9 (AFCEE, 2003). Three changes are made to the selected remedy presented in FS-9 ROD: (1) establishment of removal action levels (RALs) for certain inorganic chemicals, and petroleum hydrocarbons; (2) removal of the asphalt-batching component

from the selected remedy; and (3) the expansion of offsite disposal options to include RCRA Subtitle D facilities.

It should be noted that the removal of the asphalt batching recycling component of the selected remedy for FS-9 is not a change to the selected remedy because soil excavated from this site is considered nonrecyclable, and therefore off-site disposal of the excavated soil from this sites is compliant with the existing ROD.

B.2 Removal Action Objectives

The RAOs are site-specific qualitative goals that must be achieved to meet remedial response objectives. The RALs are the site-specific quantitative cleanup levels that will meet these goals. The remedial response objectives include: (1) reduce exposure of humans to TPH, C_5 –C_8 aliphatic hydrocarbons, and lead at the former UST location (CPT107/CPT108), TPH Hot Spot (TP-11), and the fence-line soil hot spot (SS-1) and (2) reduce exposure of ecological receptors to chromium, vanadium, and zinc in the former UST location, and fenceline soil hot spot.

Soil Target Cleanup Levels (STCLs) used for the DSRP were retained and used to develop cleanup levels for identified contaminants of concern. In 2000, AFCEE with concurrence from USEPA and MADEP revised ecological risk based STCLs for inorganic chemicals in a Technical Memorandum (AFCEE, 2000b).

In 2002, AFCEE revised phytotoxicity and invertebrate STCLs for several inorganics in an addendum to the Technical Memorandum (AFCEE,2002b).

The revised STCLs led to the development of RALs, which also took into account terrestrial plant screening levels, terrestrial invertebrate screening levels, and MMR-specific background. Development and establishment of RALs were documented in an ESD prepared in 2003 (AFCEE,2003). Furthermore, the ESD documents the establishment of MADEP Method S-1/GW-1 Extractable Petroleum Hydrocarbon/Volatile Petroleum Hydrocarbon (EPH/VPH) cleanup standards as RALs in instances where TPH were considered COCs. Presented in **Table B-1** and **Table B-2** are RALs that must be achieved to met remedial response objectives for FS-9.

Table B-1 FS-9 COCs and Respective RALs

Chemical of Concern	Cleanup Level (mg/kg)	Basis for RAL
Chromium	19	Ecological
Lead	300	Human
Vanadium	47	Ecological
Zinc	68	Ecological

Table B-2 MADEP S-1/GW-1 Standards for Petroleum Hydrocarbons

Type of Petroleum Hydrocarbons	New RAL (mg/kg)
Aliphatic Hydrocarbons	
C_5 through C_8 Aliphatic Hydrocarbons	100
C_9 through C_{12} Aliphatic Hydrocarbons	1,000
C_9 through C_{18} Aliphatic Hydrocarbons	1,000
C_{19} through C_{36} Aliphatic Hydrocarbons	2,500

Aromatic Hydrocarbons	
C_9 through C_{10} Aromatic Hydrocarbons	100
C_{11} through C_{22} Aromatic Hydrocarbons	200

B.3 Remedy Description

The selected remedy documented in the ROD (AFCEE, 1999b) is Excavation and On-site Asphalt Batching/Off-site Disposal with a contingency for In Situ Low Flow SVE. Excavation and on-site asphalt batching/off-site disposal address the remediation of shallow surface and subsurface soil with concentrations of COCs exceeding FS-9 cleanup levels. Confirmatory sampling after excavation would ensure that all soil with COC concentrations exceeding these cleanup levels were removed. The in situ SVE would address the cleanup of deeper soil if encountered at the former UST location. Groundwater monitoring would be conducted annually as required under CERCLA for at least 5 years to ensure the effectiveness of the removal/treatment activity. In addition, 5-year reviews will be performed as necessary to provide an opportunity for review of the performance of the selected remedy.

Excavated soil that is determined to exceed TCLP allowable concentrations and therefore deemed hazardous would be disposed off-site in a RCRA Subtitle C TSDF. Soil that is determined to be below TCLP allowable concentrations and therefore nonhazardous (and that are determined to contain contaminant concentrations below MADEP MCP Method 1 S-1/GW-1 standards for pesticides and Massachusetts Permitted Soil Recycling facility Summary Levels) would be treated at the on-site cold mix emulsion asphalt-batching plant.

The selected remedy for FS-9 has been modified. Data results of the pre-design sampling at the former UST location indicate that no implementation of insitu soil vapor extraction is required. The results are presented in the Pre-Design Sampling and Analysis Report (AFCEE, 2000a). Furthermore, changes to the selected remedy included deletion of the on-site asphalt batching component of the remedy; establishment of RALs; and expansion of offsite disposal options to include RCRA Subtitle D facilities. These changes are documented in an ESD for the SARAP (AFCEE, 2003).

The modified remedy consisted of excavating contaminated surface soil at two source areas [i.e., the fence-line hot spot (SS1), and the TPH hot spot (TP-11)]. Excavated soil would be transported to on-base central bulking facility for waste characterization. Excavated soil that is determined to exceed TCLP allowable concentrations and therefore deemed hazardous would be disposed off-site in a RCRA Subtitle C TSDF. Soil that is determined to be below TCLP allowable concentrations and therefore nonhazardous (and that are determined to contain contaminant concentrations below MADEP MCP Method 1 S-1/GW-1 standards for pesticides and Massachusetts Permitted Soil Recycling facility Summary Levels) would be transported offsite to a Subtitle D facility.

B.4 Remedy Implementation

AFCEE conducted remedial activities in 2001 at FS-9. Remedial activities and results of confirmatory sampling are documented in a Remedial Action Report (AFCEE, 2002a). The actions were conducted at the drainage ditch located west of the paved area in an undeveloped portion of FS-9 and outside the fenced perimeter of the active area. Two areas were excavated. Sixty-six cubic

yards of contaminated soil, was removed from the TPH hot spot (TP-11). Confirmatory soil sample results were below the RALs. Fifty-six cubic yards of contaminated soil were excavated from the fence-line hot spot (SS-1). Confirmatory Results for VPH/EPH analysis were below the RALs for the site, and the exposure point average of the lead results was below the RAL. Excavated soil was transported to an onsite central bulking facility. Soil from FS-9 was combined with soil from other sites. Composite sampling of the consolidated soil stockpiles determined that the consolidated soil was considered non-hazardous and suitable for reuse as daily cover at a Resource Conservation and Recovery Act (RCRA) Subtitle D Landfill. Soil from FS-9 was disposed of at the Taunton Landfill, in compliance with the MADEP *Reuse and Disposal of Contaminated Soil at Massachusetts Landfills Policy #COMM-97-001*.

C. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

The following activities were conducted since the last review.

- ROD: Completed in June, 1999
- Pre-Design Sampling and Analysis Report: Completed in August, 2000
- Removal Action: Completed in December, 2001
- Remedial Action Report: Completed in September, 2002
- ESD: Completed in January, 2003

D. TECHNICAL ASSESSMENT

The technical assessment component of the five-year review consists of evaluating the protectiveness of the remedy. AFCEE performed the technical assessment based on USEPA guidance provided in section 4.0 of the Comprehensive Five-Year Review Guidance (USEPA, 2001).

Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, ARARs, risk assumptions, and the results of the site inspection indicate that the remedy has been completed as intended by the ROD modified by the ESD. The excavation and offsite disposal of contaminated soil has achieved the RAOs of mitigating the migration of contaminants to groundwater and preventing direct contact with, or ingestion of contaminants in soil.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Changes in Standards and To-Be Considered

As the remedial work has been completed, ARARs and TBC guidance for soil contamination cited in the ROD and ESD have been met. There have been changes in chemical-specific ARARs and TBC guidance. The MADEP has amended its petroleum hydrocarbon cleanup standards [i.e., Massachusetts Contingency Plan regulations regarding the cleanup of petroleum hydrocarbons, which USEPA, MADEP and the AFCEE have agreed are ARARs for this site.

AFCEE also recalculated risk-based STCLs for ecological receptors to reflect current toxicity information. RALs were derived from the comparison of the following: revised STCLs, background, phytotoxicity screening levels, and invertebrate screening levels. The new cleanup levels do not change the protectiveness of the remedial action done according the to the ROD and subsequent ESD. Cleanup levels for identified in the ROD were derived from the comparison of cleanup levels used in the DSRP and background. These cleanup levels initially did not take into account invertebrate or phytotoxicity screening levels; however, they were taken into account in the ESD.

Table D-1 and **Table D-2** present changes in cleanup levels.

Table D-1: Changes in Cleanup Levels at FS-9

Contaminant	Media	ESD RAL (mg/kg)	ROD RAL (mg/kg)
Chromium	Soil	19	6.8
Vanadium	Soil	47	16
Zinc	Soil	68	15.2
Total Petroleum Hydrocarbons	Soil	See **Table D-2**	500
C_5 through C_8 Aliphatic Hydrocarbons	Soil	100	200

Table D-2 MADEP S-1/GW-1 Standards for Petroleum Hydrocarbons

Type of Petroleum Hydrocarbons	**RAL (mg/kg)**
Aliphatic Hydrocarbons	
C_5 through C_8 Aliphatic Hydrocarbons	100
C_9 through C_{12} Aliphatic Hydrocarbons	1,000
C_9 through C_{18} Aliphatic Hydrocarbons	1,000
C_{19} through C_{36} Aliphatic Hydrocarbons	2,500
Aromatic Hydrocarbons	
C_9 through C_{10} Aromatic Hydrocarbons	100
C_{11} through C_{22} Aromatic Hydrocarbons	200

Changes in Exposure Pathways

There have been no changes in the physical conditions, exposure pathways, and land use of the site that would affect the protectiveness of the remedy.

Changes in Toxicity and Other Contaminant Characteristics

There have been no changes in the toxicity factors for contaminants of concern that were used for the human health risk assessment. However, risk-based cleanup levels for ecological receptors were calculated using new toxicity information. Calculation of ecological risk-based STCLs using new toxicity information was completed in 2000 (AFCEE, 2000b). These STCLs were used in the development of RALs. Cleanup was based on these RALs.

Changes in Risk Assessment Methods:

There were no changes in human health risk assessment methodology.

Expected Progress Towards Meeting RAOS:

Implementation of the remedy has achieved RAOs.

Question C: Has any other information come into light that could call into question the protectiveness of the remedy?

There is no information that calls into question the protectiveness of the remedy.

Technical Assessment Summary:

Table D-3 presents the technical assessment summary for AOC FS-9.

Table D-3: Technical Assessment Summary for AOC FS-9

Question		Response
A	Is the removal action functioning as intended by the decision documents?	Yes
B	Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the removal action selection are still valid?	Yes
C	Has information come to light that calls into question the protectiveness of the removal action?	No

E. ISSUES

No issues have been identified.

F. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

No recommendations or follow-up actions were identified.

G. PROTECTIVENESS STATEMENT

The remedy selected for the AOC FS-9 (source control including excavation and off-site disposal) is protective of human health and the environment. Soil containing COCs above RALs have been removed.

H. REFERENCES

AFCEE, 2003. *Explanation of Significant Differences Areas of Contamination CS-10 (A, B & C); CS-16/CS-17; FS-9; SD-2/FS-6/FS-8; and SD-3/FTA-3/CY-4*. Prepared by Portage Environmental Inc. and Engineering Strategies Corporation for AFCEE/MMR Installation Restoration Program, Otis ANG Base, MA, January 2003.

AFCEE, 2002b. *Addendum to Technical Memorandum Revised Ecological Soil Target Cleanup Levels For Inorganics*. Prepared by Portage Environmental Inc. and Engineering Strategies Corporation for AFCEE/MMR Installation Restoration Program, Otis ANG Base, MA, September, 2002.

AFCEE, 2002a *Final Remedial Action Report Area of Contamination FS-9*. Prepared by ECC (Environmental Chemical Corporation) for AFCEE/MMR Installation Restoration Program, Otis ANG Base, MA, September, 2002.

AFCEE, 2000b. *Final Technical Memorandum Revised Ecological Soil Target Cleanup Levels For Inorganics*. Prepared by HAZWRAP for AFCEE/MMR Installation Restoration Program, Otis ANG Base, December, 2000.

AFCEE, 2000a. *Pre-Design Sampling &Analysis Report For: Confirmatory Sampling at CS-10/FS-24; Additional Soil Sampling at CS-10/FS-24 BLDGS 4602 &4606; Data and Equipment Evaluation for SVE/Biosparging Design; Wetlands Determination and Delineation Studies at CS-10/FS-24 and FS-18; Pre-Excavation Study and Soil Sampling at SD-4; Geophysical Investigation of the DDOU; Confirmatory Sampling at SD-5/FS-5, and Confirmatory Soil Sampling at FS-9*, Prepared by TN& Associates, Inc. for AFCEE/MMR Installation Restoration Program, Otis ANG Base, August 2000.

AFCEE, 1999b. *Record of Decision Area of Contamination FS-9*, Prepared by HAZWRAP (Hazardous Waste Remedial Actions Program), for AFCEE/MMR Installation Restoration Program, Otis ANG Base, June 1999

AFCEE, 1999a. *Drainage Structure Removal Program Remedial Action Summary Report*. Prepared by HLA (Harding Lawson Associates) for AFCEE/MMR Installation Restoration Program, Otis ANG Base, January 1999.

AFCEE, 1998c. *Proposed Plan to Cleanup Soils at Fuel Spill No. 9, Air Force Center for Environmental Excellence*, October 1998

AFCEE, 1998b. *Feasibility Study Area of Contamination FS-9*, Prepared by HAZWRAP for AFCEE/MMR Installation Restoration Program, Otis ANG Base, October 1998.

AFCEE, 1998a. *Final Remedial Investigation Report Area of Contamination FS-9, Vol I-V*. Prepared by HAZWRAP for AFCEE/MMR Installation Restoration Program, Otis ANG Base, October 1998

MADEP, 1994. *Interim Remediation Waste Policy for Petroleum Contaminated Soils,* MADEP Bureau of Waste Site Cleanup, WSC-94-400, 1994.

Metcalf & Eddy, 1994. *Fuel Systems Upgrade Report (Closure Reports CPT 106, CPT 107, CPT 108).* Installation Restoration Program, Massachusetts Military Reservation, 1994.

USEPA, 2001. *Comprehensive Five-Year Review Guidance*, EPA 540R-01-007, June 2001.

8.3.2 FIRE TRAINING AREA NO.1 (FTA-1) SOURCE

A. BACKGROUND

A.1 Site Description

Area of Contamination FTA-1 is located 500 feet north of Kittredge Road near the southern boundary of MMR (**Figure 10)**. The AOC consists of a level, cleared area of approximately three acres that was used by the MMR fire department for fire-training activities from 1958 to 1985. The AOC was closed in November 1985 because of air emission permitting difficulties. All burning occurred on the ground surface until 1983, when a concrete pad with a soil berm border was built to contain the flammable liquids.

Historically, MMR fire training occurred quarterly, and totaled 12 to 16 training fires per year. Later, this schedule was reduced to six to eight training fires per year; it is not known when this more recent schedule began. Large-volume training exercises involved flammable waste from 300 to 500 gallons per training session, while small-volume training sessions involved between 50 and 100 gallons. Flammable materials burned on-site included JP-4, AVGAS, MOGAS, diesel fuels, waste oils, solvents, paint thinners, transformer oils, and spent hydraulic fluids. These flammable liquid wastes were generated at the flightline, and were initially transported to the site in drums, and later by tank trucks. Drums were stacked on the eastern portion of the study area, and leaks reportedly were common. Trucked flammable liquids were stored at FTA-1 in a UST (or tanks), since removed (E.C. Jordan Co., 1986).

Standard operating procedures at FTA-1 involved leaving flammable material in the pits overnight after a fire training exercise to volatilize and seep into the soil; any flammable material remaining the following day was burned to eliminate potential fire hazards. It is estimated that approximately 70 percent of the ignited material burned, while the remaining 30 percent either volatilized into the atmosphere or infiltrated into the soil (E.C. Jordan Co., 1986). For the total period of operation, an estimated volume exceeding 50,000 gallons may have been spilled for fire-training purposes and, of this total, approximately 15,000 gallons (30 percent) either volatilized into the atmosphere or infiltrated into the soil.

A.2 Initial Response

Not applicable.

A.3 Basis for Taking Action

Site Investigations (SI): A field exploration program, completed in 1985, included the excavation of nine test pits and the installation of two monitoring wells in the cleared fire-training area. Soil analyses indicated the presence of oil and grease, organic halogen compounds, and lead. Analyses of groundwater samples showed PCE, 1,2-trans-dichloroethylene, TCE, total halogens, oil and grease, total organic carbon, and 2-butanone in groundwater (ABB-ES, 1995).

A preliminary Assessment field program, conducted in 1986 was intended to investigate soil contamination beneath the study area and estimate the rate and direction of groundwater flow (E.C. Jordan Co., 1988). This program consisted of completing 15 soil borings and installing three

piezometers. This investigation detected primarily fuel-related hydrocarbons in shallow soil; these chemicals include BTEX, and polynuclear aromatic hydrocarbons (PAHs).

The 1988 exploration and sampling program was designed to assess background groundwater quality and assess whether upgradient sources contribute to groundwater contamination at the FTA-1 AOC. Fieldwork included the installation of one upgradient and one downgradient well cluster (E.C. Jordan Co., 1990). Groundwater upgradient of FTA-1 was devoid of solvent or fuel-related compounds. The downgradient well contained numerous fuel-related and solvent contaminants.

In 1989, additional investigations of soil in the fire-training area and under the concrete containment pads, as well as contaminated groundwater plume definition, was conducted. Activities performed during this program included excavation of 11 testpits and four soil borings. Twelve multilevel groundwater monitoring wells were installed. Petroleum hydrocarbons were detected in 71 percent of the samples at concentrations up to 38,700 milligrams per kilogram. Laboratory analytical results from test pit and soil boring samples confirm the presence of BTEX and the chlorinated solvents TCE, PCE, and 1,2-DCE. Laboratory analysis of groundwater samples collected during this program indicate that fuel-related and chlorinated organic compounds were present at elevated concentrations in groundwater at both study area and downgradient wells.

Remedial Investigation (RI)/Feasibility Study: RI activities completed at AOC FTA-1 were intended to develop more refined estimates of the extent of soil contamination and the lateral and vertical extent of groundwater contamination associated with the AOC. Results from analytical soil sampling of test pits, surface soil, and test borings, in addition to sediment and surface water sampling of an on-site drainage pit, were used to delineate areas of residual contamination (ABB-ES, 1995).

Results of the FTA-1 source operable unit RI confirmed the presence of fuel- and solvent-related contamination in soil throughout the cleared portion of the AOC and in the sediments and surface water perched in the drainage pit. Residual contamination was highest in shallow soil (i.e. less than 10 feet deep) beneath and adjacent to the concrete pad in the center of the site clearing. In addition, PCBs, pesticides, and low levels of dioxin were detected in surface soil. Lead was consistently detected at levels greater than 10 times background levels for the MMR, and the water in the drainage pit exceeded the state and federal MCLs for lead. Data collected during the source area field investigation were used to prepare a preliminary risk assessment to evaluate risks from exposure to contaminants detected in the AOC.

Risk Evaluation Summary: A human-health Preliminary Risk Assessment (PRA) was completed to evaluate potential human-health risks associated with exposure to contaminated surface and subsurface soil under current and future site conditions, and an ecological PRA was completed to evaluate potential ecological risks associated with exposure to contaminated surface soil (zero to 2 feet bgs). Results of the ecological and human health risk assessments triggered the need for an alternative evaluation (i.e. Engineering Evaluation/Cost Analysis). Contaminants of concern (COCs) identified at AOC FTA-1 include trichloroethylene (TCE) and perchloroethylene (PCE) (ABB-ES, 1992).

Engineering Evaluation/Cost Analysis (EE/CA): AOC FTA-1 was included as part of the CS-4, FS-25, FTA-1 EE/CA completed in May 1991 (ABB-ES, 1991).

The following alternatives received detailed analysis in the EE/CA:

- Alternative 1: Land Treatment/Off-site Incineration for AOC FTA-1
- Alternative 2: Thermal Treatment for AOC FTA-1

B. REMEDIAL/REMOVAL ACTIONS

This section presents the regulatory actions, removal action objectives (RAOs), and remedy description for AOC FTA-1.

B.1 Regulatory Actions

Action Memorandum: Based on information presented in the EE/CA, the selected removal action alternative is Alternative 2, excavation and thermal treatment of AOC soil. For this alternative, approximately 16,500 cy of contaminated soil would be excavated and treated in a mobile thermal aeration unit to be temporarily operated on MMR.

A contaminant source Removal Action and a detailed design package were completed in 1992. Alternative 2 the preferred alternative includes; contaminated soil excavation/removal; low-temperature thermal desorption of contaminants from soil; segregation and disposal of various process-generated media (i.e., dust, condensate); treatment of process air stream discharge to 95 percent efficiency; and verification of soil treatment and excavation closure based on comparison of chemical analysis to predetermined soil treatment criteria.

B.2 Removal Action Objectives (RAOs)

The RAOs are site specific qualitative cleanup goals that must be achieved to meet remedial response objectives. Based on calculations from the risk assessment, the risk values calculated for current/future exposure to groundwater it was concluded that: (1) no significant current of future human health risks are associated with exposure to FTA-1 study area soil, and; soil at this study area acts as a source of groundwater contamination. The following removal action objective was developed based on these considerations:

- Remove 12,800 cubic yards of soil from the FTA-1 Study Area to eliminate sources of groundwater contamination (ABB-ES, 1991)

B.3 Removal Action Description

Thermal treatment involved a heat transfer system consisting of two chambers, each containing four large, hollow, metal corkscrews. This "jacketed screw conveyor" had special oil that flowed inside the corkscrews. The oil was heated to 600 degrees Fahrenheit. Excavated soil was placed in the chamber and, as the corkscrews turned the soil, heat transferred to the soil, which turned the fuel and solvents in the soil into vapor. Because the corkscrews were sealed, the soil did not come into contact with the oil itself, but was cleaned by the heat that was transferred from the oil through the corkscrews. The fuel and solvents contained in the vapor were removed by passing the vapor through a granular activated carbon filter. The carbon filters were periodically recycled off-Cape. Several air quality monitoring stations were located around the site to ensure protection of public health during the excavation and treatment of contaminated soil.

B.4 Remedy Implementation

Treatment of contaminated soil at the FTA-1 site began in June 1995. Approximately 22,000 tons of soil were excavated and treated between June 1995 and May 1996. In 1996, a new contract for continuing remediation services was awarded to Jacobs Engineering Group, and treatment resumed in January 1997. Soil treatment was delayed in 1997 as a result of a fire on February 26. The fire, caused by a leak within the system, caused significant damage to the treatment units. The fire was contained and did not affect the surrounding site and thermal treatment was resumed on June 30, 1997. The Soil Thermal Treatment program was completed on September 8, 1997. A total of approximately 49,000 tons of contaminated soil was treated by the Thermal Treatment program at AOC FTA-1. The FTA-1 Closure Report concluded: analytical results support the recommendation for closure as the site does not pose a risk to human health and the surrounding environment (AFCEE, 2000).

C. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

The following documents present activities that have been conducted since the last review.

- Final Closure Report FTA-1 Site: Completed in July 2000

D. TECHNICAL ASSESSMENT

The technical assessment component of the five-year review consists of evaluating the protectiveness of the remedy. AFCEE performed the technical assessment based on USEPA guidance provided in section 4.0 of the Comprehensive Five-Year Review Guidance (USEPA, 2001).

Question A: Is the remedy/removal action functioning as intended by the decision documents?

The review of documents, site inspections and the site closure report demonstrate that the remedy functioned as intended by the Action Memorandum.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

Changes in Standards and To-Be Considered

There have been no changes in standards and to-be considered guidance documents.

Changes in Exposure Pathways

There have been no changes in the physical conditions, exposure pathways, and land use of the site that would affect the protectiveness of the remedy.

Changes in Toxicity and Other Contaminant Characteristics

There have been no changes in the toxicity factors for contaminants of concern that were used for the human health risk assessment.

Changes in Risk Assessment Methods:

There were no changes in human health risk assessment methodology.

Expected Progress Towards Meeting RAOs:

Implementation of the selected remedy has achieved RAOs.

Question C: Has any other information come into light that could call into question the protectiveness of the remedy?

There is no information that calls into question of the protectiveness of the selected remedy.

Technical Assessment Summary

Table D-1 presents the technical assessment summary for AOC FTA-1.

Table D-1: Technical Assessment Summary for AOC FTA-1

Question		Response
A	Is the removal action functioning as intended by the decision documents?	Yes
B	Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the removal action selection are still valid?	Yes
C	Has information come to light that calls into question the protectiveness of the removal action?	No

E. ISSUES

No issues have been identified.

F. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

No recommendations or follow-up actions were identified.

G. PROTECTIVENESS STATEMENT

The selected remedy for AOC FTA-1 is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled.

H. REFERENCES

ABB Environmental Services, Inc. (ABB-ES), 1995. *Task 2-5, Remedial Investigation Report Area For Contamination Fire Training Area No. 1 (AOC FTA-1) Source Operable Unit;* Installation Restoration Program, Massachusetts Military Reservation, prepared for HAZWRAP; Portland, Maine; September 1995.

ABB-ES, 1992. *Action Memorandum AOCs CS-4, FS-25, & FTA-1 Source Removal*; Installation Restoration Program, Massachusetts Military Reservation, prepared for HAZWRAP; Portland, Maine; August 1992.

ABB-ES, 1991. *Engineering Evaluation/Cost Analysis CS-4, FS-25 and FTA-1 Study Areas Removal Action*; Installation Restoration Program, Massachusetts Military Reservation, prepared for HAZWRAP; Portland, Maine; September 1991.

AFCEE, 2000. *Final Closure Report FTA-1 Site*; Installation Restoration Program, Massachusetts Military reservation, prepared by Jacobs Engineering Group Inc.; July 2000.

E.C. Jordan Co., 1990. *Site Inspection Report, Field Investigation Work Conducted Spring-Summer 1988, Task 2-3B.* Installation Restoration Program; Massachusetts Military Reservation; prepared for HAZWRAP; Portland, Maine; July 1990.

E.C. Jordan Co., 1988. *Field Investigations-Summer/Fall 1986, Task 2-1, Base Landfill, Petroleum Fuel Storage Area, and Fire-Training area, Volume I – Study*. Installation Restoration Program; Massachusetts Military Reservation; prepared for HAZWRAP; Portland, Maine; July 1988.

E.C. Jordan Co., 1986. *U.S. Air Force Installation Restoration Program Phase I: Records Search, Air National Guard, Camp Edwards, U.S. Air Force, and Veterans Administration Facilities at Massachusetts Military Reservation, Task 6*; Installation Restoration Program, Massachusetts Military Reservation; prepared for Oak Ridge National Laboratory; Oak Ridge, Tennessee; December 1986.

Metcalf & Eddy, Inc., 1983. *Installation Restoration Program, Phase I – Records Search*; *Otis Air National Guard Base, Massachusetts*; January, 1983

USEPA, 2001. Co*mprehensive Five-Year Review Guidance*, EPA 540R-01-007, June 2001.

8.1 Category 2 Map

Placeholder for:
FIGURE 10:
MAP - CATEGORY 2 SITES

Table 4.-- Category 2 Sites (Remedy Complete) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Selected Remedy/Removal Action (5)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (6)	Progress Since Last Five-Year Review (7)	Remarks (8)
FS-9	Fuel Spill 9 Current Product Spill 108	1998, Remedial Investigation. 1998, Feasibility Study.	AOC FS-9 occupies approximately seven acres of the south-central potion of MMR in the Cantonment Area near Building 1369 and currently is being used for military vehicle maintenance. AOC consists of three areas. They include: (1) surface and subsurface soils at the tank pit area (SS-4) (2)surface soils at the fence line " hot spot" area (SS-1) , and (3) surface soils at the TPH hot spot area (TP-11).	Soil excavation, on-base asphalt batching , off-base disposal for nonrecyclable material, site restoration. In addition a contingency remedy of an SVE system was to be implemented if subsurface soil contamination at the tank pit area was beyond the practical limits of excavation.	Three USTs and related fuel dispensing equipment removed as part of the MMR FSU Program in 1994. A catch basin and leaching well were removed as part of the DSRP. CERCLA Remedial Action completed in 2002. The Remedial Action was modified, however selected remedial action is protective of human health and the environment. Implemented remedial action included excavation of 98 cubic yards of soil, offsite disposal at RCRA Subtitle D facility, and site restoration. SVE implementation was not necessary.	ROD completed in June 1999. Explanation of Significant Differences completed in 2002. Remedial Action performed in 2002. Remedial Action Report completed in 2002.	None
FTA-1	Fire Training Area 1	1991, Remedial Investigation. 1991, EE/CA for AOCs FTA-1, FS-25,and CS-4.	FTA-1 is a former fire training area which operated from 1958 through 1985. Flammable materials burned in this area included various fuels, oils, solvents, thinners, and hydraulic fluids.	Thermal Treatment which includes: excavation of contaminated soil, treatment using a low-temperature thermal treatment process, and the backfilling of treated soil into the excavated area.	Treatment of contaminated soils began in 1995. Approximately 22,000 tons of soil were excavated and treated between June 1995 and May 1996. Treatment resumed in January 1997 and was completed in September 1997, where approximately 38,000 tons of contaminated soil were treated.	Final Closure Report FTA-1 dated July 2000.	None

Notes:

1. “Site” column contains the Site Identifier (i.e. CS-1 CG). Sites with “Source” have groundwater contamination associated with them and denote the source area. Sites with “GW” denote groundwater contamination (i.e. plume). When neither “Source” nor “GW” follow the Site ID, then “Site” is assumed to be a source area only.
2. “Title” column contains the Site Name (i.e. Chemical Spill-1 Coast Guard)
3. “Site Chronology” column contains a brief listing of all major documents and the year of their finalization.
4. “Background” column contains a brief history of the site (i.e., site use and location).
5. “Construction/…” column contains a brief summary of all “cleanup” actions on the site including actions occurring during the report period.
6. "Selected Remedy/Removal Action" column contains a description of the selected remedy or removal action
7. “Progress Since last Five-Year Review” column contains a brief summary of IRP actions occurring during the report period.
8. “Remarks” column contains the document selecting the action on that particular site.

8.4 Category 2 Summary

The Five-Year Review requirements for these sites consisted of evaluating each site under Questions B and C. There is no active remedy operating at these sites; therefore, Question A is not applicable to them. Question B was evaluated for each of these sites, however, to assure that no changes had occurred to site conditions, maximum contaminant levels (MCL), exposure pathways or receptors during the reporting period. Question C was also considered for all Category 2 sites, to evaluate any new information that may have come to light for any site during the reporting period.

Summarizing the category, the assumptions used in the closure decisions are still valid and no new information came to light during the reporting period, therefore, the decisions for all the Category 2 sites are still considered protective.

9.0 Category 3 Sites, Remedy Functioning

9.1 Map

All sites in this category may be found on the regional map at Figure 11.

9.2 Data Summary Table

Like the two previous categories, the summary data and information for Category 3 sites are also found in a data summary table (Table 5). Unlike the previous categories, there are individual technical assessments following this table for each site.

9.3 Technical Assessments

Technical assessments for the following Category 3 sites are stand-alone documents, with its own set of page numbers. Occasionally, a reference is made to a figure within the main document, such as a map.

Click each to view.

9.3.1 Ashumet Valley Ground Water
9.3.2 Chemical Spill No.1 (CG) Source
9.3.3 Chemical Spill No.4 Source
9.3.4 Chemical Spill No.4 Ground Water
9.3.5 Chemical Spill No.4 (CG), Fuel Spill No.1 (CG) Source
9.3.6 Chemical Spill No.5 Source
9.3.7 Chemical Spill No.8 (CG) Source
9.3.8 Chemical Spill No.10 (Details A-I), Fuel Spill No. 24 Source
9.3.9 Chemical Spill No.10 Ground Water
9.3.10 Chemical Spill No.11 Source

Click each to view.

9.1 Category 3 Map

Placeholder for:
FIGURE 11:
MAP - CATEGORY 3 SITES

Table 5. -- Category 3 Sites (Remedy Functioning) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
AV GW	Ashumet Valley (groundwater)	1994, SERGOU RI. 1994, FTA-1 RI. 1995, Ashumet Valley RI. 1995, Record of Decision for Interim Action (IROD). 1997, Ashumet Valley Plume Response Decision. 1999, Completion of Extraction / Treatment / Infiltration (ETI) system. 2002, Interim Remedial Action Report.	The AV plume is sourced by AOCs FTA-1, CS-16 and CS-17. An ETI system was completed in November 1999. The Ashumet Pond Phosphorus Management Plan was completed in August 2000.	An ETI system was constructed in November 1999.	Installation of ETI treatment system in November 1999. Ashumet Pond Phosphorous Management Plan dated August 2001. Annual and Semiannual System Performance and Ecological Impact Monitoring Reports.	Ashumet Valley Plume Response Decision, September 1997
CS-1 CG	Chemical Spill 1 Coast Guard	1986, Phase I Records Search. 1989, Site Inspection, Field Investigation. 1991, RI, USCG Transmitter Station, CS-1. 1995, RI Report, USCG Transmitter Station. 1995, ROD USCG Transmitter Station (CS-1[USCG]).	The Transmitter Station includes the main building, which houses the generator and offices; a 4,000 gallon aboveground fuel tank; and storage sheds. Activities that may have introduced hazardous substances occurred from 1969 through 1975. These activities included disposal of waste solvents, and the burial of used electrical components which contained transformer oil, transformers and capacitors.	No further action was needed with respect to groundwater, however, semi-annual groundwater monitoring for VOCs is required.	In April 2001 the ROD was modified to include the sampling of 4 other monitoring wells in the CS-1(USCG) area on a semi-annual basis, and the data will be evaluated to determine if future action is warranted.	ROD USCG Transmitter Station (CS-1[USCG]), September 1995.
CS-4 Source	Chemical Spill 4	1994, 1996, and 2001, Site Investigations. 2001, EE/CA, 2002 Action Memorandum. 1995-1996, soil removal.	CS-4 soil operable unit includes a former gasoline station, a suspected waste disposal pit, piles of sand and debris, a depression area, and a drainage swale along Connery Avenue.	Soil removal and treatment in 1995-1996 was treated with FTA-1 soil by low temperature thermal desorption. Approximately 2,900 cy of contaminated soil was excavated in 2002. UST removal in 2002.	Implementation of the EE/CA and AM including additional delineation sampling and the removal of approximately 2,900 cy of contaminated soil.	CS-4 Engineering Evaluation/Cost Analysis dated October 2001, and the CS-4 Action Memorandum dated January 2002.
CS-4 CG	United States Coast Guard Chemical Spill No. 4 Hanger 128 Area	1993, Site Investigation. 1998, EE/CA. 1999, Action Memorandum. 2003, Action Memorandum Addendum.	CS-4 USCG is located at included hanger 128 and the surrounding area. Hanger 128 was used to maintain both USAF and USCG aircraft. FS-1 USCG, which consists of two spills of aviation gasoline, is located at hanger 128 and the surrounding area.	Implemented removal action included excavation of 291 cubic yards of soil, offsite disposal at RCRA Subtitle D facility, and site restoration.	Action Memorandum finalized in 1999. Action Memorandum Addendum finalized in 2003.	Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum finalized in June 1999. Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum Addendum finalized in February 2003.

Table 5. -- Category 3 Sites (Remedy Functioning) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
CS-4 GW	Chemical Spill 4 (ground water)	1992, Interim ROD was signed. 1999, Southwest Operable Unit (SWOU) Remedial Investigation and SWOU Feasibility Study. 2000 Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes.	The SWOU RI confirmed that this plume had detached from the CS-4 source area. The leading edge of the CS-4 plume intersects the trailing edge of the FS-28 plume. An extraction system has been operational at the leading edge of the plume since 1993. However, this system only captures a portion of the plume.	Installation of a Extraction / Treatment / Infiltration system was constructed in November 1993.	In 1999 the SWOU Remedial Investigation and SWOU Feasibility Study were completed. In 2000 the Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes was completed.	Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes finalized February 2000.
CS-5	Chemical Spill - 5 Refueler Maintenance Shops	1993, Site Inspection. 1998, EE/CA. 1999, Action Memorandum. 2003, Action Memorandum Addendum.	CS-5 is located at Building 3461 at the northeastern corner of Beaman and Weaver roads. From 1941 to 1946, the building was used by the U.S. Army as a weapons repair shop. From 1955 to 1967, the USAF used the building as a refueler maintenance shop and spray paint shop.	Soil excavation, off-base disposal, and site restoration.	Action Memorandum finalized in 1999. Action Memorandum Addendum finalized in 2003.	Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum finalized in June 1999. Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum Addendum finalized in February 2003.
CS-8 CG	Chemical Spill 8 (Coast Guard)	2000, Preliminary Assessment. 2001, Site Investigation. 2002, EE/CA. 2002, Action Memorandum.	The Coast Guard transmitter station property occupies approximately 224 acres adjacent to the eastern boundary of the MMR and has been operated by the USCG since 1969. Prior to 1969, the transmitter station was operated by the U.S. Air Force.	None	Preliminary Assessment finalized in March 2000, Site Investigation finalized in November 2001, CS-8 (CG) Abandoned Radio Cabinet Area Engineering Evaluation/Cost Analysis finalized in May 2002. Action Memorandum finalized August 2002.	CS-8 (CG) Abandoned Radio Cabinet Area Action Memorandum finalized in August 2002.
CS-10 Detail A Source	Chemical Spill - 10 Detail A Hydraulic Pumping Station	1989, Site Inspection. 1993, Remedial Investigation. 1996, Feasibility Study. 1999, CS-10/FS-24 ROD. 2003, Explanation of Significant Differences.	CS-10 was a BOMARC ground-to air missile launcher site. CS-10 Detail A is a spill site associated with the Hydraulic Pumping Station located southeast of Building 4672.	Implemented remedial action included excavation of 29 cubic yards of soil, offsite disposal at RCRA Subtitle D facility, and site restoration.	CS-10/FS-24 ROD finalized in July 1999. Explanation of Significant Differences finalized in January 2003.	CS-10/FS-24 ROD finalized in July 1999. Explanation of Significant Differences finalized in January 2003.
CS-10 Detail B Source	Chemical Spill - 10 Detail B Building 6441 Spill	1989, Site Inspection. 1993, Remedial Investigation. 1996, Feasibility Study. 1999, CS-10/FS-24 ROD. 2003, Explanation of Significant Differences.	CS-10 was a BOMARC ground-to air missile launcher site. CS-10 Detail B consists of surface soil contamination associated with operations at a former BOMARC maintenance shop (Building 6441).	Implemented remedial action included excavation of 34 cubic yards of soil, offsite disposal at RCRA Subtitle D facility, and site restoration.	CS-10/FS-234 ROD finalized in July 1999. Explanation of Significant Differences finalized in January 2003.	CS-10/FS-24 ROD finalilzed in July 1999. Explanation of Significant Differences finalized in January 2003.

Table 5. -- Category 3 Sites (Remedy Functioning) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
CS-10 Detail C Source	Chemical Spill - 10 Detail C UST	1989, Site Inspection. 1993, Remedial Investigation. 1996, Feasibility Study. 1999, CS-10/FS-24 ROD. 2002, SVE system installation.	CS-10 was a BOMARC ground-to air missile launcher site. Detail C consists of subsurface soil contamination associated a former 300 gallon jet propellant fuel (JP-4) underground storage tank located on the north side of Building 4602.	UST was removed as part of the Drainage Structure Removal Program in 1996. A SVE system was constructed in 2002.	CS-10/FS-24 ROD finalized in July 1999. SVE system construction in 2002. SVE system start-up February 2002. UST removal during SVE installation.	CS-10/FS-24 ROD finalized in July 1999.
CS-10 Detail D Source	Chemical Spill -10 Detail D - Security Fence	1989, Site Inspection. 1993, Remedial Investigation. 1996, Feasibility Study. 1999, CS-10/FS-24 ROD.	CS-10 was a BOMARC ground-to air missile launcher site. CS-10 Detail D consists of surface soil contamination associated with waste oil disposal activities. The disposal site is located in a clearing in the woods approximately 150 ft. north of the BOMARC security fence.	None	No remedial action was performed due to post-ROD sampling results of the Remedial Action Delineation Sampling Program completed in 2001. No action is required to be protective of human health and the environment.	CS-10/FS-24 ROD finalized in July 1999.
CS-10 Detail E Source	Chemical Spill - 10 Detail E- Southern Storm Sewer Drainage Ditch	1989, Site Inspection. 1993, Remedial Investigation. 1996, Feasibility Study. 1999, CS-10/FS-24 ROD. 2003, Explanation of Significant Differences.	CS-10 was a BOMARC ground-to air missile launcher site. CS-10 Detail E consists of surface soil and sediment contamination associated with the Southern Storm Sewer Drainage Ditch	Implemented remedial action included excavation of 59 cubic yards of soil, offsite disposal at RCRA Subtitle D facility, and site restoration.	CS-10/FS-234 ROD finalized in July 1999. Explanation of Significant Differences finalized in January 2003.	CS-10/FS-24 ROD finalized in July 1999. Explanation of Significant Differences finalized in January 2003.
CS-10 Detail F Source	Chemical Spill 10 Detail F, Eastern Storm Sewer Outfall Drainage Impoundment.	1989, Site Inspection. 1993, Remedial Investigation. 1996, Feasibility Study. 1999, CS-10/FS-24 ROD.	CS-10 was a BOMARC ground-to air missile launcher site. Detail F consists of surface soil and sediment contamination associated with the Eastern Storm Sewer Outfall Drainage Impoundment	None	CS-10/FS-24 ROD finalized in July 1999. Soil and sediment sampling conducted as part of the implementation of the ROD. A post-ROD ecological risk evaluation is being conducted to address the presence of State-listed species and to determine if soil removal is needed.	CS-10/FS-24 ROD finalized in July 1999.
CS-10 Detail G (FS-24) Source	Chemical Spill -10 Detail G (FS-24) - Building 4606 UST.	1989, Site Inspection. 1993, Remedial Investigation. 1996, Feasibility Study. 1999, CS-10/FS-24 ROD.	CS-10 was a BOMARC ground-to air missile launcher site. CS-10 Detail G also known as FS-24 designates a fuel spill associated with the 1985 removal of a 25,000 gallon UST located at the northwest corner of Building 4606.	A 25,000 gallon UST located at the northwest corner of Building 4606 was removed in 1985.	CS-10/FS-24 ROD finalized in July 1999. Post-ROD sampling in 2001 determined that additional soil removal was not needed.	CS-10/FS-24 ROD finalized in July 1999.

Table 5. -- Category 3 Sites (Remedy Functioning) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
CS-10 Source Detail H	Chemical Spill 10, Detail H	1989, Site Inspection. 1993, Remedial Investigation. 1996, Feasibility Study. 1999, CS-10/FS-24 ROD.	CS-10 was a BOMARC ground-to-air missile launcher site. CS-10 Detail H consists of subsurface soil contamination associated with a former storage area that was located adjacent to, and immediately west of, former Building 4642.	Implemented removal action included excavation of 114 cubic yards of soil, offsite disposal, and site restoration.	CS-10/FS-24 ROD finalized in July 1999.	CS-10/FS-24 ROD finalized in July 1999.
CS-10 Source Detail I	Chemical Spill 10, Detail I	1989, Site Inspection. 1993, Remedial Investigation. 1996, Feasibility Study. 1999, CS-10/FS-24 ROD.	CS-10 was a BOMARC ground-to-air missile launcher site. CS-10 Detail I consists of surface and subsurface soil contamination associated with maintenance operations at Building 4601.	None	CS-10/FS-24 ROD finalized in July 1999.	CS-10/FS-24 ROD finalized in July 1999.
CS-10 GW	Chemical Spill 10 (groundwater)	1985, Site evaluation by U.S. Army Environmental Hygiene Agency. 1986-1988, Site Investigation. 1995, Record of Decision of Interim Action (IROD). 1996 Remedial Investigation. 1998, CS-10 Plume Response Decision.	The primary sources of the plume eminent from the 38-acre BOMARC and UTES site. The BOMARC missile site was operated between 1960 and 1973 and UTES has operated since 1978 to maintain and store armored and other wheeled vehicles.	CS-10 Sandwich Road Extraction, Treatment and Reinjection system start up, 18 May 1999. CS-10 In-plume Treatment system startup, 24 June 1999. CS-10 Southern & Southwest treatment system startup, 27 April 2000. TCE Plume extraction well startup, 22 January 2000.	CS-10 Plume Response Decision, August 1998. Groundwater remediation systems start-up dates include May 1999, June 1999, January and April 2000. Annual and semiannual System Performance and Ecological Impact Monitoring reports. Draft CS-10 Remedial Investigation Report, 2001.	CS-10 Plume Response Decision, August 1998.
CS-11	Chemical Spill 11 Building 1116 Pesticide Shop	1993, Site Investigation. 1998, EE/CA. 1999, Action Memorandum. 2003, Action Memorandum Addendum.	CS-11 is located between South Outer Road and Asphalt Road, consists of Building 1116 as a pesticide shop for storage an mixing of pesticides.	Soil excavation, off-base disposal for nonrecyclable material, site restoration.	Action Memorandum finalized in 1999. Action Memorandum Addendum finalized in 2003.	Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum finalized in June 1999. Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum Addendum finalized in February 2003.
CS-16	Chemical Spill 16 Sewage Treatment Plant Sludge Disposal	1996, Remedial Investigation. 1998, Feasibility Study. 1999, Record of Decision. 2003, Explanation of Significant Differences.	CS-16/CS-17 consists of an infiltration sand filter and sludge drying beds located adjacent to the former MMR Sewage Treatment Plant.	Implemented remedial action included excavation of 391 cubic yards of soil, offsite disposal at RCRA Subtitle D facility, and site restoration.	CS-16/CS-17 ROD finalized in May 1999. Explanation of Significant Differences finalized in January 2003.	CS-16/CS-17 ROD finalized in May 1999. Explanation of Significant Differences finalized in January 2003.

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Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
CS-17	Chemical Spill 17 Sewage Treatment Plant Sludge Disposal	1996, Remedial Investigation. 1998, Feasibility Study. 1999, Record of Decision. 2003, Explanation of Significant Differences.	CS-16/CS-17 consists of an infiltration sand filter and sludge drying beds located adjacent to the former MMR Sewage Treatment Plant.	Implemented remedial action included excavation of 3,286cubic yards of soil, offsite disposal at RCRA Subtitle D facility, and site restoration.	CS-16/CS-17 ROD finalized in May 1999. Explanation of Significant Differences finalized in January 2003.	CS-16/CS-17 ROD finalized in May 1999. Explanation of Significant Differences finalized in January 2003.
CS-20 GW	Chemical Spill 20 (groundwater)	1999, Southwest Operable Unit (SWOU) Remedial Investigation and SWOU Feasibility Study. 2000 Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes	The SWOU study area was conceived as the area between the LF-1 and CS-10 plumes in July 1997. Site records were reviewed to identify possible sources of SWOU groundwater contamination. The CS-20 plume was first detected in 1997 during the FS-28 RI drilling program. Due to the detached nature of the CS-20 plume, the exact sources of the plume have not been discovered.	None	In 1999 the SWOU Remedial Investigation and SWOU Feasibility Study were completed. In 2000 the Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes was completed. Completion of fieldwork for the wellfield design (Phase I and II, 2001-2002).	Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes finalized in February 2000.
CS-21 GW	Chemical Spill 21 (groundwater)	1999, Southwest Operable Unit (SWOU) Remedial Investigation and SWOU Feasibility Study. 2000 Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes	The SWOU study area was conceived as the area between the LF-1 and CS-10 plumes in July 1997. Site records were reviewed to identify possible sources of SWOU groundwater contamination. The CS-21 plume was first detected al low concentrations of TCE in residential well samples collected north of Route 151 in 1997. Due to the detached nature of the CS-21 plume, the exact sources of the plume have not been discovered.	None	In 1999 the SWOU Remedial Investigation and SWOU Feasibility Study were completed. In 2000 the Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes was completed. Completion of fieldwork for the wellfield design (Phase I and II, 2001-2002).	Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes finalized in February 2000.
CS-22	Chemical Spill 22	1999, Preliminary Assessment. 2001, Site Investigation. 2002, Engineering Evaluation/Cost Analysis. 2002, Action Memorandum.	The site consists of a former sand and gravel borrow pit located near the east-central portion of the MMR.	418 Tons of contaminated soil were removed in the spring of 2000. 525 CY of contaminated soil was excavated in August and November of 2002.	A preliminary assessment was completed in 1999. A site investigation was completed in 2001. An EE/CA and AM were completed in April and May of 2002 respectively.	CS-22 Engineering Evaluation/Cost Analysis, finalized April 2002. CS-22 Action Memorandum finalized May 2002.

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Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
CY-4	Coal Yard 4	1987, Site Investigation. 1989, Remedial Investigation. 1993, Supplemental Remedial Investigation. 1997, Feasibility Study. 1998, 6 AOC Record of Decision. 2003, Explanation of Significant Differences.	1955 to 1978 coal was stockpiled directly on ground prior to installation of a concrete pad. Coal ash disposal area received ash from Central Heating Plan from 1955 to 1992.	42,000 cy of material were excavated and used as fill and the base landfill cap in 1994. As a result of ROD implementation, approximately 625 cy of contaminated soil were excavated in Fall 2001.	Implementation of the 1998 ROD, including additional delineation sampling and removal of contaminated soils. Finalization of ESD in January 2003.	ROD FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4 and SD-5/FS-5 Source Areas finalized September 1998. Explanation of Significant Differences finalized January 2003.
DDOU	Drum Disposal Operable Unit	1993, Site Investigation. 1998, Engineering Evaluation/Cost Analysis. 1999, Action Memorandum. 2003, Action Memorandum.	The AOC is bound to the north by Kitteridge Road and an abandoned utility pole line, on the east by Sandwich Road, and on the south and west by the MMR boundary.	Eleven drums were removed by the National Guard Bureau in 1994. Implemented removal action included excavation of 213 cubic yards of soil, offsite disposal at RCRA Subtitle C facility, and site restoration.	Action Memorandum finalized in 1999. Action Memorandum Addendum finalized in 2003.	Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum finalized in June 1999. Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum Addendum finalized in February 2003.
EB GW	Eastern Briarwood	1994, SERGOU RI. 1996, Final Eastern Briarwood and Western Aquafarm Groundwater Monitoring Plan.	The Eastern Briarwood monitoring area is located in the southern portion of Otis ANGB. Military activities in this area of the ANGB have released organic and inorganic contaminants to groundwater, however, the specific source area of the Eastern Briarwood plume is not known. Interim Record of Decision, September 1995. Post-ROD change documented in Strategic Plan dated 1997.	Long Term Monitoring	Annual groundwater monitoring and comprehensive reports.	1996, Final Eastern Briarwood and Western Aquafarm Groundwater Monitoring Plan.
FS-1 GW	Fuel Spill 1 (groundwater)	1983, Phase I records search. 1985, Phase II investigation. 1989, an SI was performed in the source area. 1990, initial RI completed on source area and groundwater. 1993, 1995, & 1998-9 additional groundwater and soil sampling efforts were conducted. 1999, Feasibility Stucy. 2000, Record of Decision. 2001, Wellfield Design Report.	AOC FS-1 was used by the 551st Airborne Early Warning and Control Wing to test fuel dump valves between 1955 and 1970. Records searches indicate that aircraft fuel valves were tested by being opened and the fuel allowed to drain. The exact quantity of fuels released is unknown.	In April 1999, pilot test of leading edge groundwater extraction system began operation. This leading edge system includes 175 shallow extraction well points (with 95 currently being operated), on e deep EW, a treatment system building (2 GACs) and a shallow re-injection trench.	Record of Decision for Area of Contamination FS-1, April 2000. Wellfield Design Report finalized in June 2001. A fire destroyed the treatment facility in October 2002, and the process for rebuilding the facility is underway.	Record of Decision for Area of Contamination FS-1, April 2000.

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Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
FS-1 CG	United States Coast Guard Fuel Spill-1 Hanger 128 Fuel Spill	1993, Site Investigation. 1998, EE/CA. 1999, Action Memorandum. 2003, Action Memorandum Addendum.	CS-4 USCG is located at included hanger 128 and the surrounding area. Hanger 128 was used to maintain both USAF and USCG aircraft. FS-1 USCG, which consists of two spills of aviation gasoline, is located at hanger 128 and the surrounding area.	Implemented removal action included excavation of 291 cubic yards of soil, offsite disposal at RCRA Subtitle D facility, and site restoration.	Action Memorandum finalized in 1999. Action Memorandum Addendum finalized in 2003.	Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum finalized in June 1999. Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum Addendum finalized in February 2003.
FS-4	Fuel Spill 4 Current Product Tank 7	1993, Site Investigation. 1998, EE/CA. 1999, Action Memorandum. 2003, Action Memorandum Addendum.	FS-4 consists of an area surrounding the former Building 178, a fuel pumphouse, located on the base airfield. Six USTs were installed at the pumphouse in 1956. This site is within the restricted zone of the flightline.	No removal action was performed due to results of the Post-AM Sampling Program completed in 1999.	Action Memorandum finalized in 1999. Action Memorandum Addendum finalized in 2003.	Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum finalized in June 1999. Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum Addendum finalized in February 2003.
FS-5	Fuel Spill 5	1988 Site Investigation. 1989, Remedial Investigation. 1993, Supplemental Remedial Investigation. 1997, Feasibility Study. 1998, Record of Decision.	Three refueling aircraft were destroyed in a fire, resulting in the FS-5 fuel spill of up to 15,000 gallons of Aviation fuel.	Approximately 2,500 cy of contaminated soil was excavated from SD-5 in 2001. A SVE system was installed at SD-5 in November of 2001.	Implementation of the ROD, including additional delineation sampling, removal of contaminated soils and the installation of a SVE system.	Record of Decision FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4 and SD-5/FS-5 Source Areas dated September 1998.
FS-6	Fuel Spill 6	1988, Site Investigation. 1989, Remedial Investigation. 1993, Supplemental Remedial Investigation. 1997, Feasibility Study. 1998, Record of Decision.	Fuel spills FS-6 and FS-8 occurred in the early 1960's on the aircraft maintenance ramp resulting in the release of approximately 23,000 gallons of fuel. Both spills were reportedly washed into the storm sewer that discharges to SD-2. FS-6 is part of a group identified as SD-2/FS-6/FS-8.	120 cy of contaminated soil was excavated from SD-2 as part of an Immediate Response Action performed under the MCP in 1996. Approximately 300 cy of contaminated soil was excavated in the summer of 2002.	Implementation of the ROD, including additional delineation sampling and removal of contaminated soils.	Record of Decision FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 Source Areas dated September 1998.
FS-7	Fuel Spill 7 Current Product Tank 115	1993, Site Inspection. 1998, EE/CA. 1999, Action Memorandum. 2003, Action Memorandum Addendum.	FS-7 is located adjacent to the former Building 1820 on the northwest rotary. According to a records search, up to 11,000 gallons of fuel oil from a UST leaked at the site. The UST was removed in 1985.	A UST was removed in 1985. Implemented removal action included excavation of 18 cubic yards of soil, offsite disposal at RCRA Subtitle D facility, and site restoration.	Action Memorandum finalized in 1999. Action Memorandum Addendum completed in 2003.	Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum finalized in June 1999. Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum Addendum finalized in February 2003.

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Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
FS-8	Fuel Spill 8	1988, Site Investigation. 1989, Remedial Investigation. 1993, Supplemental Remedial Investigation. 1997, Feasibility Study. 1998, Record of Decision.	Fuel spills FS-6 and FS-8 occurred in the early 1960's on the aircraft maintenance ramp resulting in the release of approximately 23,000 gallons of fuel. Both spills were reportedly washed into the storm sewer that discharges to SD-2. FS-8 is part of a group identified as SD-2/FS-6/FS-8.	120 cy of contaminated soil was excavated from SD-2 as part of an Immediate Response Action performed under the MCP in 1996. Approximately 300 cy of contaminated soil was excavated in the summer of 2002.	Implementation of the ROD, including additional delineation sampling and removal of contaminated soils.	Record of Decision FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 Source Areas dated September 1998.
FS-10	Fuel Spill 10	1985-1986, Field Investigations. 1989, Remedial Investigation. 1994, Supplemental Remedial Investigation. 1998, Record of Decision.	The PFSA operated as the main fuel delivery and distribution area for the flightline from the early 1950s through present day. FS-10 occurred at the PFSA in the 1960s, and was a 2,000 gallon jet fuel spill in one of the pumphouses. FS-10, FS-11 and the PFSA have been grouped together to form one area of concern.	Air Sparging/SVE system implemented as part of ROD was partially completed in the summer of 2002.	Implementation of the ROD, including installation of an Air Sparging/SVE system.	Record of Decision FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 Source Areas dated September 1998.
FS-11	Fuel Spill 11	1985-1986, Field Investigations. 1989, Remedial Investigation. 1994, Supplemental Remedial Investigation. 1998, Record of Decision.	The PFSA operated as the main fuel delivery and distribution area for the flightline from the early 1950s through present day. FS-11 occurred at the PFSA in the 1960s, and was a 2,000 gallon jet fuel spill in one of the pumphouses. FS-10, FS-11 and the PFSA have been grouped together to form one area of concern.	Air Sparging/SVE system implemented as part of ROD was partially completed in the summer of 2002.	Implementation of the ROD, including installation of an Air Sparging/SVE system.	Record of Decision FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 Source Areas dated September 1998.
FS-12 Source	Fuel Spill 12 (source)	1990, the contamination was discovered. 1993, Remedial Investigation. 1996, Action Memorandum.	FS-12 is the location of a leak in an abandoned fuel pipeline along Greenway Road. The pipeline carried both jet fuel and aviation gasoline during its use from 1965 to 1973. The leak occurred in 1972 where an estimated 70,000 gallons of petroleum was discharged.	Air sparging /vapor extraction at the source area was conducted from October 1995 through February 1998 to remove EDB and VOCs from the vadose zone.	8 monitoring wells were added to the FS-12 performance monitoring evaluation program and are sampled semi-annually for EDB and VOCs. Completion of FS-12 Source Area Removal Action Summary Report, March 2000.	FS-12 Source Area Removal Action Summary Report, March 2000.

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FS-12 GW	Fuel Spill 12 (groundwater)	1990, the contamination was discovered. 1993, Remedial Investigation. 1995, Record of Decision for Interim Action Containment of Seven Groundwater Plumes. 1997, FS-12 Extraction/Treatment/ Reinjection system began operation.	FS-12 plume is the result of a leak of an estimated 70,000 gallons of jet fuel and aviation gasoline from a fuel pipeline along Greenway Road in 1972.	Extraction/Treatment/Reinjection system for FS-12 began operation in September 1997.	Annual and semiannual System Performance and Ecological Impact Monitoring reports.	Final Record of Decision of Interim Action Containment of Seven Groundwater Plumes completed in 1995.
FS-13 GW	Fuel Spill 13 (groundwater)	1999, Southwest Operable Unit (SWOU) Remedial Investigation and SWOU Feasibility Study. 2000 Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes	Within the footprint of the CS-10 plume lies a small area of contamination and a minor plume associated with FS-13. The source of this contamination is a fuel spill that is believed to have occurred in 1972.	Annual long-term monitoring began on November 2000. Each year samples will be collected from three monitoring wells and analyzed for VOCs and EDB. Monitoring will continue for approximately 20 years.	In 1999 the SWOU Remedial Investigation and SWOU Feasibility Study were completed. In 2000 the Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes was completed.	Record of Decision for the CS-4, CS-20, CS-21, & FS-13 Plumes dated February 2000.
FS-18	Fuel Spill -18 Fuel Transfer Point	1993, Site Investigation. 1998, Engineering Evaluation/Cost Analysis. 1999, Action Memorandum. 2003, Action Memorandum Addendum.	FS-18 was a World War II Motor Pool and fuel transfer site located off North Gaffney Street on the northwestern side of MMR.	Four USTs were reportedly removed in 1985.	Action Memorandum finalized in 1999. Action Memorandum Addendum completed in 2002. Removal Action completed in 2002. Post Action Memorandum delineation sampling for removal action indicated that contaminants were below cleanup goals and therefore no removal action was performed.	Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum finalized in June 1999. Priority 2 and 3 Study Areas and Drum Disposal Operable Unit Source Removal Action Memorandum Addendum finalized in February 2003.
FS-28 GW	Fuel Spill 28 (groundwater)	Investigations found EDB to be upwelling into the Coonamessett River in Falmouth in 1996. 1999, SWOU Remedial Investigation; 1999, SWOU Feasibility Study; 2000, FS-28 and FS-29 Groundwater Feasibility Study; 2000 FS-28 and FS-29 Record of Decision.	The FS-28 plume can not be attributed to specific known source areas on the MMR. The FS-28 plume was investigated as part of a comprehensive groundwater operable unit known as the Southwest Operable Unit (SWOU).	A time critical (installation of extraction well 1) removal action, and a non-time critical (addition of shallow-wellpoints) removal action were implemented in October 1997, and April 1999 respectively. Town water main extensions and residential water hook-ups to the water main were constructed.	The SWOU RI was finalized in May, 1999; SWOU FS was finalized in June 1999; FS-28 and FS-29 Groundwater Feasibility Study was finalized in January 2000; and the FS-28 and FS-29 ROD was finalized in October 2000.	Record of Decision for the Fuel Spill-28 and Fuel Spill 29 Plumes dated October 2000.

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Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
FS-29 GW	Fuel Spill 29 (groundwater)	The FS-29 plume was discovered during the SWOU RI. 1999, SWOU Remedial Investigation; 1999, SWOU Feasibility Study; 2000, FS-28 and FS-29 Groundwater Feasibility Study; 2000 FS-28 and FS-29 Record of Decision. 2002, Technical Memorandum.	The FS-29 plume can not be attributed to specific known source areas on the MMR. The FS-29 plume is being investigated as part of a comprehensive groundwater operable unit known as the SWOU.	2001-2002 Design field investigations (Phase 1 and 2) were conducted. FS-29 Plume Technical Memorandum was finalized in March 2002.	The SWOU RI was finalized in May, 1999; SWOU FS was finalized in June 1999; FS-28 and FS-29 Groundwater Feasibility Study was finalized in January 2000; and the FS-28 and FS-29 ROD was finalized in October 2000. FS-29 Plume Technical Memorandum was finalized in March 2002.	Record of Decision for the Fuel Spill-28 and Fuel Spill 29 Plumes dated October 2000.
FTA-2	Fire Training Area 2	1988, Site Investigation. 1998, Remedial Investigation. 1993, Supplemental Remedial Investigation. 1998, Record of Decision.	AOC FTA-2/LF-2 occupies approximately 11 acres and includes a firefighter-training area developed on top of a buried municipal landfill. Firefighter-training exercised conducted at FTA-2 may have included burning waste oils, aviation gasoline, jet fuel, and waste petroleum distillation solvents.	Air Sparging/SVE system implemented as part of ROD in November 2001.	Implementation of the ROD, including installation of an Air Sparging/SVE system.	Record of Contamination FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 Source Areas dated September 1998.
FTA-3	Fire Training Area 3	1987, Site Investigation. 1989, Remedial Investigation. 1993, Supplemental Remedial Investigation. 1997, Feasibility Study. 1998, Record of Decision. 2003, Explanation of Significant Differences.	FTA-3 was used for firefighter-training exercises from 1956 to 1958. Subsequent to firefighter-training exercises, the site was backfilled with construction debris, fill, and coal ash.	None	As a result of ROD implementation, the soils at FTA-3 were sampled and analyzed. Concentrations of the contaminants of concern were below removal action levels and deemed nonhazardous.	ROD FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 Source Areas dated September 1998. Explanation of Significant Differences completed in 2002.
LF-1 Source	Landfill-1 MMR Main Sanitary Landfill Source	1983, Records search. 1985, 1986, & 1988, Site Investigations. 1989, Remedial Investigation. 1993, Record of Decision Interim Remedial Action Main Base Landfill (AOC LF-1) Source Area Operable Unit.	LF-1 received general refuse, fuel tank sludge, and hazardous materials. Two cells were constructed (1970 cell and post-1970 cell). The post 1970 cell was closed in 1989.	Constructing a landfill cover system on the 1970 Cell, Post-1970 Cell, and Kettle Hole. Conducting post-closure maintenance and monitoring of the cover system for a minimum of 30 years. Monitoring landfill gas and groundwater quality semiannually.	Annual System Performance and Ecological Impact Monitoring Reports.	Record of Decision Interim Remedial Action Main Base Landfill (AOC LF-1) Source Area Operable Unit, January 1993.

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Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
LF-1 GW	Land Fill No. 1 (Groundwater)	1995, Final Record of Decision for Interim Action Containment of Seven Groundwater Plumes. 1996, Final Remedial Investigation Main Base Landfill (AOC LF-1). 1997, Plume Response Decision. 1999, LF-1 Treatment system startup.	The LF-1 groundwater plume was generated primarily from leachate from the main base landfill. Chlorinated VOCs, aromatic hydrocarbons, and inorganic analytes were observed in groundwater downgradient of the landfill. The highest concentrations and largest number of contaminants were associated with the 1970 and post 1970 cells, confirming that these cells were a primary source of contaminants impacting the groundwater.	August 1999, completion of LF-1 Extraction/ Treatment/ Infiltration remedial system.	Completion of LF-1 ETI remedial system. Annual System Performance and Ecological Impact Monitoring Reports.	LF-1 Plume Response Decision December 1997. Record of Decision for Interim Action Containment of Seven Groundwater Plumes September 1995.
LF-2	Landfill-2	1986, Phase I Records Search. 1988, SI completed. 1989, RI completed. 1993, supplemental RI completed. 1997, FS completed. 1998, ROD completed.	LF-2 received domestic refuse form 1940 to 1944.	Air Sparging/SVE system implemented as part of ROD Areas of Contamination FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5.	Implementation of the ROD including AS/SVE insitu system.	ROD Areas of Contamination FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 September 1998.
LF-7	Landfill 7	1986, Phase I Records Search.	LF-7 is located in a gravel pit north of the present sanitary landfill . It is an area where radioactive electron tubes from EC-121 aircraft radar sets were disposed of.	Land use restriction, access restrictions, and annual radiological survey.	Institutional controls limit access to site as required by the Decision Document.	Decision Document Radar Tube Burial Landfill (LF-7 Study Area) November 1993.
PFSA	Primary Fuel Storage Area (Soil Vapor Extraction)	1985-1986, Field Investigations. 1989, Remedial Investigation. 1994, Supplemental Remedial Investigation. 1998, Record of Decision.	The PFSA operated as the main fuel delivery and distribution area for the flightline from the early 1950s through present day. FS-10 and FS-11 occurred at the PFSA in the 1960s, and were a combined 4,000 gallons of spilled fuel. Also, 6,000 of fuel-contaminated water was spilled from a fuel pumphouses in 1996. Of the 6,000 gallons, approximately 300 gallons was diesel and/or jet fuel.	Air Sparging/SVE system implemented as part of ROD completed in the summer of 2002.	Implementation of the ROD, including installation of an Air Sparging/SVE system.	Record of Decision FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 Source Areas dated September 1998.

Table 5. -- Category 3 Sites (Remedy Functioning) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
SD-2	Storm Drain 2	1988, Site Investigation. 1989, Remedial Investigation. 1993, Supplemental Remedial Investigation. 1997, Feasibility Study. 1998, Record of Decision. 2003, Explanation of Significant Differences.	SD-2 began receiving stormwater runoff from the PFSA, aircraft maintenance ramp, hangar nosedocks, and other support buildings. OWS was constructed at SD-2 in 1968 and removed in 2002. SD-2 is part of a group identified as SD-2/FS-6/FS-8.	120 cy of contaminated soil was excavated from SD-2 as part of an Immediate Response Action performed under the MCP in 1996. Approximately 300 cy of contaminated soil was excavated in the summer of 2002.	ROD finalized September 1998. Implementation of the ROD, including additional delineation sampling and removal of contaminated soils. ESD finalized in 2003.	Record of Decision FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 Source Areas dated September 1998. Explanation of Significant Differences finalized January 2003.
SD-3	Storm Drain 3	1987, Site Investigation. 1989, Remedial Investigation. 1993, Supplemental Remedial Investigation. 1998, Record of Decision. 2003, Explanation of Significant Differences.	SD-3 began receiving the discharge from storm drains serving aircraft hangars and several streets west of Granville Avenue and the discharge from the Central Heating Plant in the 1950s. SD-3 is part of a group identified as SD-3/FTA-3/CY-4.	Approximately 400 cy of contaminated soil were excavated in the Fall 2001.	ROD finalized September 1998. Implementation of the ROD, including additional delineation sampling and removal of contaminated soils. ESD finalized in 2003.	ROD FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 Source Areas dated September 1998. Explanation of Significant Differences finalized January 2003.
SD-4	Storm Drain 4	1989 through 1991, a two phase Site Investigation. 1994, Remedial Investigation. 1997, Feasibility Study. 1998, Record of Decision. 2002, Wetland Criteria Development for Sediments at SD-4. 2002 Ecological Risk Assessment Technical Memorandum.	SD-4 began receiving stormwater runoff from the runway, aircraft maintenance ramp, aircraft hangars, support buildings, and a fuel pumphouse in the 1950s. A oil/water separator was constructed at SD-4, south of Reilly Road in 1968.	None	ROD finalized September 1998. Ecological evaluation completed which determined that sediment removal was not necessary. Ecological risk resulting from the hydric soil abutting pond is still being evaluated.	Record of Decision FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 Source Areas dated September 1998.
SD-5 Source	Storm Drain 5 (Source)	1988, Site Investigation. 1989, Remedial Investigation. 1993, Supplemental Remedial Investigation. 1997, Feasibility Study. 1998, Record of Decision.	SD-5 began receiving stormwater runoff from a number of sources including the Eastern and Western Aquafarms, the former NDIL, the Corrosion Control Shop, and the Permanent Field Training Site Hangar in the 1950s.	Approximately 2,500 cy of contaminated soil was excavated from SD-5 in 2001. A SVE system was installed at SD-5 in November of 2001.	Implementation of the ROD, including additional delineation sampling, removal of contaminated soils and the installation of a SVE system.	Record of Decision FTA-2/LF-2, PFSA/FS-10/FS-11, SD-2/FS-6/FS-8, SD-3/FTA-3/CY-4, SD-4, and SD-5/FS-5 Source Areas dated September 1998.
SD-5N GW	Storm Drain No. 5 North	1994, SERGOU RI. 1995, Record of Decision for Interim Action Containment of Seven Groundwater Plumes. 1996, Remedial Investigation SD-5/FS-5. 1997, startup of SD-5 N ETR groundwater treatment system.	The SD-5 groundwater plume is located downgradient of the SD-5 source areas. The plume consists of primarily of TCE. Groundwater from this plume discharges to Johns Pond. The SD-5 plume was divided into a Northern and Southern plume when the Sandwich Road Treatment Facility (then known as the SD-5 North Treatment system) came on line in 1997.	1997, startup of SD-5 N ETR groundwater treatment system.	SD-5 North plume has been reduced and the extraction fence is down to one operating well. Annual System Performance and Ecological Impact Monitoring Reports.	1995, Final Record of Decision for Interim Action Containment of Seven Groundwater Plumes. 1997, Storm Drain 5 South Plume Response Decision.

Table 5. -- Category 3 Sites (Remedy Functioning) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
SD-5S GW	Storm Drain No. 5 South	1994, SERGOU RI. 1995, Record of Decision for Interim Action Containment of Seven Groundwater Plumes. 1996, Remedial Investigation SD-5/FS-5. 1997, SD-5 Plume Response Decision. 1999, startup of SD-5 Recirculation Wells. Startup of SD-5 S/TCE Extraction Wells.	The SD-5 groundwater plume is located downgradient of the SD-5 source areas. The plume consists of primarily of TCE. Groundwater from this plume discharges to Johns Pond. The SD-5 plume was divided into a Northern and Southern plume when the Sandwich Road Treatment Facility (then known as the SD-5 North Treatment system) came on line in 1997.	1999, startup of SD-5 Recirculation Wells. 2000 startup of SD-5 S/TCE Extraction Wells.	Completion of SD-5 recirculation wells in June 1999, and completion of SD-5 extraction well in January 2000. Annual System Performance and Ecological Impact Monitoring Reports.	1995, Final Record of Decision for Interim Action Containment of Seven Groundwater Plumes. 1997, Storm Drain 5 South Plume Response Decision.
WA GW	Western Aquafarm	1994, SERGOU RI. 1996, Final Eastern Briarwood and Western Aquafarm Groundwater Monitoring Plan.	The Western Aquafarm, located west and southwest of the Otis ANGB runways, was used for the storage and transfer of aviation gasoline and JP-4 jet fuel in the 1950's and 1960's. 1994, 6 25,000 gallon USTs and associated piping were removed. FTA-2 and LF-2 are also possible contamination sources.	Long Term Monitoring	Annual groundwater monitoring and comprehensive reports.	1996, Final Eastern Briarwood and Western Aquafarm Groundwater Monitoring Plan.

Notes:

1. “Site” column contains the Site Identifier (i.e. CS-1 CG). Sites with “Source” have groundwater contamination associated with them and denote the source area. Sites with “GW” denote groundwater contamination (i.e. plume). When neither “Source” nor “GW” follow the Site ID, then “Site” is assumed to be a source area only.
2. “Title” column contains the Site Name (i.e. Chemical Spill-1 Coast Guard)
3. “Site Chronology” column contains a brief listing of all major documents and the year of their finalization.
4. “Background” column contains a brief history of the site (i.e., site use and location).
5. “Construction/…” column contains a brief summary of all “cleanup” actions on the site including actions occurring during the report period.
6. “Progress Since last Five-Year Review” column contains a brief summary of IRP actions occurring during the report period.
7. “Remarks” column contains the document selecting the action on that particular site.

9.4 Category 3 Summary

The Five-Year Review requirements for these sites consisted of evaluating all three questions for each site. With very few exceptions, the remedies were functioning as intended by the original decision documents (Question A). There were few or no changes in assumptions (site conditions, MCLs, exposure pathways, receptors) (Question B) and no unfavorable information came to light, either from the AFCEE investigators or the community to call these sites' protectiveness into question (Question C). Any exceptions have been noted and discussed in the Technical Assessments and summarized as issues in Table 7.

Summarizing the category, although there were a few exceptions to the three questions, the protectiveness of the remedies can still be considered sound, either in the short or long term.

10.0 Category 4 Sites, Under Investigation

10.1 Map

All sites in this category may be found on the regional map at Figure 12.

10.2 Data Summary Table

Category 4 sites are currently being investigated and there is not enough data to make decisions regarding remedial actions at these sites. Using available information, a discussion of each of the sites is provided and a summary of the information available for each site is reported in the data summary table (Table 6).

10.3 Site Discussions

Site discussions for the following Category 4 sites are stand-alone documents, with its own set of page numbers. Occasionally, a reference is made to a figure within the main document, such as a map.

10.3.1 Chemical Spill No.18 Source

10.3.2 Chemical Spill No.19 Source

10.3.3 Chemical Spill No.19 Ground Water

10.3.4 Chemical Spill No.23 Ground Water

10.3.5 Fuel Spill No.13 Source

These documents are shown in the next 20 pages.

10.3.1 CHEMICAL SPILL NO. 18 (CS-18)

A. BACKGROUND

A.1 Site Description

The CS-18 site is an area of about 1.5 acres and consists of a single artillery firing point, designated as Gun Position-9 (GP-9) which is located north of the cantonment area, west of the CS-10 source area (**Figure 12**). GP-9 was used for artillery training from the World War II era until 1997. In July 2001, the CS-18 site was used for artillery setup and mock firing exercises. GP-9 is one of several artillery firing points located north south and west of the Camp Edwards Impact Area.

During previous studies of the gun positions, GP-9 was chosen as representative of the worst-case conditions for live ammunition firing and propellant burning of all the firing points. The GP-9 was selected because it was one of the most used gun positions (apparently due to its proximity to the cantonment area of the base) and had the greatest mass of propellant burning during the 15-month period preceding the initial 1987 investigation (USAEHA, 1987). CS-18 was initially designated as a CERCLA site based on the use of the area for burning excess artillery propellant on the ground, an activity that was discontinued in the early 1990s. The remaining gun positions will be evaluated under the Camp Edwards Impact Area Groundwater Study Program (IAGWSP).

A.2 Initial Responses

Not applicable.

A.3 Basis for Taking Action

Two investigations of the soil and/or groundwater contamination at CS-18 have been conducted previously. The first was conducted by the United States Army Environmental Hygiene Agency (USAEHA) in 1987, and the second by the United States Army Center for Health Promotion and Preventive Medicine USACHPPM in 1994.

1987 Soil Contamination Study: The purpose of this study was to determine whether the ash remaining from burning bags of propellant at Camp Edwards was a hazardous waste and to determine the extent of environmental contamination in the soil from past propellant burning operations. The conclusion was that due to the high annual precipitation and the sandy nature of the soil at MMR, there is the potential to contaminate the groundwater beneath theses sites. The recommendations were to install groundwater-monitoring wells to determine whether contamination had reached the water table and to discontinue burning propellants on the ground surface (USAEHA, 1987).

1994 USACHPPM Site Inspection (SI): USACHPPM completed a site inspection (SI) at GP-9 in October 1994. The SI included a preliminary human health and ecological risk evaluation. Field activities for the SI included soil sampling at a total of 18 locations, collected from three depths: surface (0 – 1 foot bgs) and subsurface (2 to 4 and 5 to 7 feet bgs). A total of 54 soil samples and 14 background samples were collected and analyzed for total metals, explosives compounds, and SVOCs. Four groundwater-monitoring wells were install and groundwater samples were analyzed for explosives compounds, metals, VOCs, SVOCs, pesticides and polychlorinated biphenyls (PCBs),

herbicides, and ethylene dibromide (EDB). The groundwater sample results did not indicate any significant contamination (USACHPPM, 1994).

Supplemental Site Investigation (SI): AFCEE completed a Supplemental SI for CS-18 in September 2002. The CS-18 SSI sampling effort included the following:

- Sampling of surface soil (0 to 0.5 feet bgs) and shallow subsurface soil (1.5 to 2 feet bgs) at 12 locations within the site,
- Sampling of subsurface soil (2,4,6, and 8 feet bgs) at three locations in the vicinity of the most elevated surface soil contamination,
- Installation, development, and sampling of three groundwater monitoring wells at two downgradient locations in the vicinity of the site,
- Sampling of the four existing groundwater monitoring wells at the site, and
- Analysis of all the soil and groundwater samples for a suite of organic compounds and inorganic elements that have a reasonable probability of being present at the site given the historical activities.

The analytical data was collected, and the nature and extent of the contaminants of potential concern were developed. The analytical data were used to conduct a human health and ecological screening-level risk assessment to determine the overall impact of the contaminants on potential receptors at the site (AFCEE, 2002).

AFCEE is currently within the contamination assessment phase of the CS-18 study area investigation. The decision to proceed with a RI, NFA DD, or EE/CA has yet to be determined.

B. REMEDIAL/REMOVAL ACTIONS

This section presents the regulatory actions, removal action objectives (RAOs), and remedy description for the CS-18 study area.

B.1 Regulatory Actions

At this time, no remedy has been proposed. AFCEE has is currently implementing recommendations of the SSI. Analytical results from the additional soil and groundwater sampling results will be used to determine an appropriate course of action for the CS-18 site [i.e. No Further Action Decision Document (NFA DD), Engineering Evaluation/Cost Analysis EE/CA or Remedial Investigation (RI)].

B.2 Removal Action Objectives (RAOs)

AFCEE is currently within the contamination assessment phase of the CS-18 study area investigation. The decision to proceed with a RI, NFA DD, or EE/CA has yet to be determined. At this time no RAOs have been selected for the study area.

B.3 Remedy Description

Not applicable, no remedy has been proposed at this time.

B.4 Remedy Implementation

This subsection is not applicable since no remedy has been selected.

C. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

The following activities were conducted/observed since the last review.

- Human Health Risk Assessment, Open Burning of Propellant Bags: Completed in January 1999 (USAEHA, 1999)
- Chemical Spill-18 Supplemental Site Investigation: Completed in September 2002 (AFCEE, 2002)

D. TECHNICAL ASSESSMENT

The technical assessment component of the five-year review consists of evaluating the protectiveness of the remedy. AFCEE performed the technical assessment based on USEPA guidance provided in section 4.0 of the Comprehensive Five-Year Review Guidance (USEPA 2001).

Question A: Is the remedy functioning as intended by the decision documents?

This question is not applicable since no remedy has been selected and CS-18 source area is presently in the CERCLA investigation process.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Changes in Standards and To-Be Considered

This question is not applicable since no remedy has been selected and CS-18 source area is presently in the CERCLA investigation process.

Changes in Exposure Pathways

This question is not applicable since no remedy has been selected and CS-18 source area is presently in the CERCLA investigation process.

Changes in Toxicity and Other Contaminant Characteristics

This question is not applicable since no remedy has been selected and CS-18 source area is presently in the CERCLA investigation process.

Changes in Risk Assessment Methods:

This question is not applicable since no remedy has been selected and CS-18 source area is presently in the CERCLA investigation process.

Expected Progress Towards Meeting RAOS:

This question is not applicable since no remedy has been selected and CS-18 source area is presently in the CERCLA investigation process.

Question C: Has any other information come into light that could call into question the protectiveness of the remedy?

This question is not applicable since no remedy has been selected and CS-18 source area is presently in the CERCLA investigation process.

Technical Assessment Summary:

Table D-1 presents a Technical Assessment summary for the CS-18 study area.

Table D-1: Technical Assessment Summary for CS-18 Study Area

Question Item	Question	Response
A	Is the removal action functioning as intended by the decision documents?	N/A
B	Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the removal action selection are still valid?	N/A
C	Has information come to light that calls into question the protectiveness of the removal action?	N/A

E. ISSUES

The following recommendations are based on conclusions drawn from the Final CS-18 Supplemental Site Investigation (AFCEE, 2002)

- Collect additional surface soil (0 to 6 inches bgs) and shallow (18 to 24 inches bgs) subsurface soil samples to constrain the extent of contamination around the currently delineated site. These samples would be analyzed for nitroaromatic explosive residues (nitroaromatic, nitramine and nitrate esters), pesticides, herbicides, VOCs, Metals, SVOCs, dioxins/furans and perchlorate.
- Complete an additional round of groundwater sampling from eleven monitoring wells located at and in the vicinity of the site. The groundwater samples will be analyzed in accordance with EPA methods for explosive compounds, VOCs, SVOCs, pesticides, herbicides, dioxins/furans and percholrate.

F. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Provide a summary of the analytical results from the recommended soil and groundwater sampling and include an evaluation of the data. The analytical results would then be used by the RPMs to determine an appropriate course of action for the CS-18 site (i.e. NFA DD, EE/CA or RI)

G. PROTECTIVENESS STATEMENT

A protectiveness determination for the CS-18 study area cannot be made at this time until further information is obtained.

H. REFERENCES

AFCEE, 2002. *Final Chemical Spill-18 Supplemental Site Investigation Technical Memorandum; Prepared* by Jacobs Engineering Group Inc. for AFCEE/MMR, Installation Restoration Program, Otis ANG Base, MA. September 2002.

USACHPPM, 1994. *Draft Final Site Inspection, Geohydrologic Study, Propellant Burning at Firing Points (CS-18), Massachusetts Military Reservation, MA*; Prepared by U.S. Army Center for Health Promotion Medicine and preventive medicine, Aberdeen Proving Ground, MD; October 1994.

USAEHA, 1987. *Interim Report, Hazardous Waste Study No. 37-26-0165-87, Investigation of Soil Contamination from Propellant Burns, Camp Edwards Massachusetts, 25-29 June and 14-15 July 1987;* Prepared by U.S. Army Center for Health Promotion Medicine and preventive medicine, Aberdeen Proving Ground, MD; September 1987.

USAEHA, 1999. *Final Report, Human Health Risk Assessment, Open Burning of Propellant Bags, Massachusetts Military Reservation, MA*; Prepared by U.S. Army Center for Health Promotion Medicine and preventive medicine, Aberdeen Proving Ground, MD, January 1999.

USEPA, 2001. *Comprehensive Five-Year Review Guidance*, EPA 540R-01-007, June, 2001.

10.3.2 CHEMICAL SPILL NO. 19 (CS-19) SOURCE

A. BACKGROUND

A.1 Site Description

The CS-19 Study Area is located in the west-central region of the MMR Impact Area (**Figure 12**). Currently, the CS-19 Study Area has a soil and groundwater component. The CS-19 Study Area contains an inactive site used historically for ordnance disposal; it measures approximately once acre in size, as defined by a perimeter road with an approximate 125 foot radius.

The magnetic anomalies were shown to be buried ordnance and metallic debris from ordnance and waste disposal. Surface soil at the CS-19 study area contain a variety of nonvolatile contaminants, including SVOCs, metals, explosives, dioxins/furans, pesticides, and herbicides.

A.2 Initial Responses

Not applicable.

A.3 Basis for Taking Action

AFCEE is currently completing the RI to determine if action is required, the basis for taking action will be determined based on the conclusions of the RI.

B. REMEDIAL/REMOVAL ACTIONS

This section presents the regulatory actions, removal action objectives (RAOs), and remedy description for the CS-19 source area.

B.1 Regulatory Actions

At this time, no remedy has been proposed. AFCEE is currently completing the RI to determine if remedial action requires evaluation.

B.2 Removal Action Objectives (RAOs)

AFCEE is currently completing the RI for the CS-19 Study Area. The decision to proceed with a FS for which RAOs will be defined is to be determined by conclusions of the RI. For soil the following RAO has been recommended in the Draft Final CS-19 RI (AFCEE, 2002):

- Prevent or reduce off-site residential exposure to water containing unacceptable concentrations of the risk drivers attributable to CS-19 (RDX, alpha-BHC, DDT, and arsenic).

B.3 Remedy Description

This subsection is not applicable since no remedy has been selected.

B.4 Remedy Implementation

Not applicable, no remedy has been proposed at this time. AFCEE is currently completing the RI.

C. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

The following activities were conducted/observed since the last review.

- Chemical Spill-19 Remedial Technologies Identification and Screening Memorandum completed in January 2001 (AFCEE, 2001)
- Draft Final RI completed in March 2002 (AFCEE, 2002)

D. TECHNICAL ASSESSMENT

The technical assessment component of the five-year review consists of evaluating the protectiveness of the remedy. AFCEE performed the technical assessment based on USEPA guidance provided in section 4.0 of the Comprehensive Five-Year Review Guidance (USEPA 2001).

Question A: Is the remedy functioning as intended by the decision documents?

This question is not applicable since no remedy has been selected and CS-19 source area is presently in the CERCLA investigation process.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Changes in Standards and To-Be Considered

This question is not applicable since no remedy has been selected and CS-19 source area is presently in the CERCLA investigation process.

Changes in Exposure Pathways

This question is not applicable since no remedy has been selected and CS-19 source area is presently in the CERCLA investigation process.

Changes in Toxicity and Other Contaminant Characteristics

This question is not applicable since no remedy has been selected and CS-19 source area is presently in the CERCLA investigation process.

Changes in Risk Assessment Methods:

This question is not applicable since no remedy has been selected and CS-19 source area is presently in the CERCLA investigation process.

Expected Progress Towards Meeting RAOS:

This question is not applicable since no remedy has been selected and CS-19 source area is presently in the CERCLA investigation process.

Question C: Has any other information come into light that could call into question the protectiveness of the remedy?

This question is not applicable since no remedy has been selected and CS-19 source area is presently in the CERCLA investigation process.

Technical Assessment Summary:

Table D-1 presents a Technical Assessment summary for the CS-19 source area.

Table D-1: Technical Assessment Summary for CS-19 Source Area

Question Item	Question	Response
A	Is the removal action functioning as intended by the decision documents?	N/A
B	Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the removal action selection are still valid?	N/A
C	Has information come to light that calls into question the protectiveness of the removal action?	N/A

E. ISSUES

AFCEE and regulatory agencies have agreed to cleanup the source area soil contamination be conducting a non-time critical removal action, however an agreement must be reached on the cleanup level for RDX in order to proceed. Additionally, the draft RI report has not been finalized.

F. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The recommendations and follow-up actions are: upon agreement of the soil cleanup level for RDX, and EE/CA document and Action memorandum should be prepared prior to the soil removal; and the CS-19 RI Report should be finalized.

G. PROTECTIVENESS STATEMENT

A protectiveness determination for the CS-19 source area contamination cannot be made at this time until further information is obtained. AFCEE is currently completing a RI. AFCEE has determined that there is not an immediate danger, which would require time-critical response for the CS-19 source area.

H. REFERENCES

AFCEE, 2002. *Draft Final Chemical Spill-19 Remedial Investigation Report* Prepared by Jacobs Engineering for AFCEE/MMR, Installation Restoration Program, Otis ANG Base, MA. March, 2002.

AFCEE, 2001. *Chemical Spill-19 Remedial Technologies Identification and Screening Memorandum* Prepared by Jacobs Engineering for AFCEE/MMR, Installation Restoration Program, Otis ANG Base, MA. January 2001.

USEPA, 2001. *Comprehensive Five-Year Review Guidance*, EPA 540R-01-007, June, 2001.

10.3.3 CHEMICAL SPILL NO.19 (CS-19) GROUND WATER

A. BACKGROUND

A.1 Site Description

The CS-19 groundwater plume is located in the west-central region of the MMR Impact Area. The suspected source of the CS-19 groundwater plume is an inactive site historically used for ordnance disposal; it measures approximately once acre in size, as defined by a perimeter road with an approximate 125-foot radius.

Leaching of explosives compounds [e.g., Royal Demolition Explosive (RDX), Trinitrotoluene (TNT), and High Melting Explosive (HMX)] from the CS-19 Source Area has been confirmed by the presence of these compounds in monitoring wells. RDX is the only explosives compound detected above a Health Advisory (HA) level. The RDX plume does not discharge to surface water and has not migrated off –post. The RDX groundwater plume is approximately 2,700 feet downgradient from the CS-19 Source Area. It should be noted that explosives compounds have been detected in upgradient wells, suggesting there may be other sources influencing groundwater beneath CS-19.

A.2 Initial Responses

None.

A.3 Basis for Taking Action

AFCEE is currently completing the RI to determine if action is required. RDX has been detected above the HA level of 2 μg/L in several monitoring wells. Basis for taking action will be determined based on the conclusions of the RI.

B. REMEDIAL ACTIONS

This section presents the regulatory actions, remedial action objectives (RAOs), and remedy description for the CS-19 Plume.

B.1 Regulatory Actions

At this time, no remedy has been proposed. AFCEE is currently completing the RI to determine if remedial action requires evaluation.

B.2 Remedial Action Objectives

AFCEE is currently completing the RI for the CS-19 groundwater plume. The decision to proceed with a FS for which RAOs will be defined is to be determined by conclusions of the RI. However, AFCEE has developed preliminary RAOs to protect human health, which is presented in the Remedial Technologies Identification and Screening Memorandum (AFCEE, 2000). For groundwater, the preliminary RAOs include:

- Prevent or reduce residential exposure to RDX exceeding 2 μg/L in groundwater.

- Restore aquifer to its beneficial uses with a reasonable timeframe.

B.3 Remedy Description

Not applicable, no remedy has been proposed at this time. AFCEE is currently completing the RI.

B.4 Remedy Implementation

Not applicable, no remedy has been proposed at this time. AFCEE is currently completing the RI.

C. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

The following activities were conducted/observed since the last review.

- Chemical Spill-19 Remedial Technologies Identification and Screening Memorandum completed in January 2001 (AFCEE, 2001)
- Draft Final RI completed in March 2002 (AFCEE, 2002)

D. TECHNICAL ASSESSMENT

The technical assessment component of the five-year review consists of evaluating the protectiveness of the remedy. AFCEE performed the technical assessment based on USEPA guidance provided in section 4.0 of the Comprehensive Five-Year Review Guidance (USEPA 2001). **Table D-1** presents a Technical Assessment summary.

Question A: Is the remedy functioning as intended by the decision documents?

Not applicable, site characterization activities are ongoing. A Draft Final RI was submitted in March 2002 (AFCEE, 2002).

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Changes in Standards and To-Be Considered

N/A

Changes in Exposure Pathways

N/A

Changes in Toxicity and Other Contaminant Characteristics

N/A

Changes in Risk Assessment Methods:

N/A

Expected Progress Towards Meeting RAOS:

N/A

Question C: Has any other information come into light that could call into question the protectiveness of the remedy?

N/A

Technical Assessment Summary:

Table D-1: Technical Assessment Summary for the CS-19 Plume		
Question Item	**Question**	**Response**
A	Is the removal action functioning as intended by the decision documents?	N/A
B	Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the removal action selection are still valid?	N/A
C	Has information come to light that calls into question the protectiveness of the remedy?	N/A

E. ISSUES

Upgradient sources may exist for explosives compound contamination. Furthermore, other contaminants (herbicides, pesticides) that were identified as COCs in the RI risk assessment were detected in elevated concentrations in crossgradient and upgradient wells suggesting there may be other potential sources.

F. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Completion of the RI is required to determine if remedial action requires evaluation.

G. PROTECTIVENESS STATEMENT

A protectiveness determination for the CS-19 groundwater contamination cannot be made at this time until further information is obtained. AFCEE is currently completing a RI. AFCEE has determined that there is not an immediate danger, which would require time-critical response for the CS-19 plume.

H. REFERENCES

AFCEE, 2001. *Chemical Spill-19 Remedial Technologies Identification and Screening Memorandum Prepared* by Jacobs Engineering for AFCEE/MMR, Installation Restoration Program, Otis ANG Base, MA. January 2001

AFCEE, 2002. *Draft Final Chemical Spill-19 Remedial Investigation Report Prepared* by Jacobs Engineering for AFCEE/MMR, Installation Restoration Program, Otis ANG Base, MA. March 2002

USEPA, 2001. *Comprehensive Five-Year Review Guidance*, EPA 540R-01-007, June 2001.

10.3.4 CHEMICAL SPILL NO.23 (CS-23) GROUND WATER

A. BACKGROUND

A.1 Site Description

The CS-23 groundwater plume is a recent discovery of chlorinated VOC groundwater contamination between the LF-1, CS-10, and CS-21 plumes. The investigation was conducted to follow-up detections of TCE above its MCL of 5 µg/l in the monitoring well 69MW1531 (AFCEE, 2002).

A.2 Initial Responses

None

A.3 Basis for Taking Action

This subsection is not applicable since no remedy has been selected and CS-23 is presently in the CERCLA investigation process.

B. REMEDIAL ACTIONS

This section presents the regulatory actions, RAOs, and remedy description for the CS-23 Plume.

B.1 Regulatory Actions

At this time, no remedy has been proposed. AFCEE is starting the CERCLA site investigation process.

B.2 Remedial Action Objectives

This subsection is not applicable since no remedy has been selected and CS-23 is presently in the CERCLA investigation process.

B.3 Remedy Description

This subsection is not applicable since no remedy has been selected and CS-23 is presently in the CERCLA investigation process.

B.4 Remedy Implementation

This subsection is not applicable since no remedy has been selected and CS-23 is presently in the CERCLA investigation process.

C. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

The following activities were conducted/observed since the last review.

- CS-23 Study Area was identified in 69MW1531 Investigation Report (AFCEE, 2002).

D. TECHNICAL ASSESSMENT

The technical assessment component of the five-year review consists of evaluating the protectiveness of the remedy. AFCEE performed the technical assessment based on USEPA guidance provided in section 4.0 of the Comprehensive Five-Year Review Guidance (USEPA 2001). **Table D-1** presents a Technical Assessment summary.

Question A: Is the remedy functioning as intended by the decision documents?

This subsection is not applicable since no remedy has been selected and CS-23 is presently in the CERCLA investigation process.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

This subsection is not applicable since no remedy has been selected and CS-23 is presently in the CERCLA investigation process.

Question C: Has any other information come into light that could call into question the protectiveness of the remedy?

This subsection is not applicable since no remedy has been selected and CS-23 is presently in the CERCLA investigation process.

Table D-1: Technical Assessment Summary for the CS-23 Plume

Question Item	Question	Response
A	Is the removal action functioning as intended by the decision documents?	Yes
B	Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the removal action selection are still valid?	Yes
C	Has information come to light that calls into question the protectiveness of the remedy?	No

E. ISSUES

None

F. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

None

G. PROTECTIVENESS STATEMENT

A protectiveness determination for the CS-23 groundwater contamination cannot be made at this time until further information is obtained. AFCEE has determined that there is not an immediate danger, which would require time-critical response for the CS-23 plume.

H. REFERENCES

AFCEE, 2002. *69MW1531 Remedial Investigation Letter Report* Prepared by Jacobs Engineering for AFCEE/MMR, Installation Restoration Program, Otis ANG Base, MA. August 9, 2002

USEPA, 2001. *Comprehensive Five Year Review Guidance*, EPA 540R-01-007, June, 2001.

10.3.5 FUEL SPILL NO. 13 (FS-13) SOURCE

A. BACKGROUND

A.1 Site Description

The FS-13 Study Area occupies approximately 4,000 square feet and is located in the Cantonment Area, east of the Connery Avenue Rotary and south of the water tower (**Figure 12**) on MMR.

A.2 Initial Response

Records Search: The fuel spill, which reportedly occurred at FS-13, was discovered in 1972 when a puddle of fuel was observed at the ground surface during a routine walk-over inspection of an underground fuel supply pipeline. Subsequently, the area was excavated and a porous section of pipe was replaced. The fuel supply pipeline at FS-13 was historical used for the transport of both aviation gasoline (AVGAS) and JP-4 fuel and is the same pipeline that was the source of the FS-12 spill. According to the Phase I Records Search, the leak consisted of approximately 2,000 gallon of JP-4 jet fuel; however, volume and composition of the spill could not be confirmed (E.C. Jordan, 1986). The area investigated was determined from recollections of personnel who discovered the spill and subsequently repaired the pipeline.

A.3 Basis for Taking Action

Site Inspection (SI): An SI conducted in 1995 included the following:

- A passive soil gas survey to identify areas of residual contamination
- Trenching and exposure of the pipeline in the area identified by the soil gas survey to: evaluate where the repair occurred; collect soil samples for headspace flame ionization detector (FID) field screening; and obtain samples for off site analysis.
- Collection of two surface soil samples within the vicinity of the pipeline, base of FID headspace readings from the trench area.
- Installation of five primary test borings for lithologic characterization and environmental soil sample analyses, to determine if the spill impacted subsurface soil and groundwater. Samples were analyzed for VOCs, SVOCs, TPH, Pesticides, PCBs, and TAL.
- Completion of four monitoring wells to determine whether groundwater contamination is associated with the site. Samples were analyzed for VOCs, SVOCs, TPH, Pesticides, PCBs, TAL, and EDB.
- Water level measurements to determine groundwater flow direction and gradient.

The SI field program successfully identified and partially delineated an interval of contaminated soil in the capillary fringe above the water table at FS-13, approximately 70 ft bgs. The SI concludes that the observed soil and groundwater analytical data indicates that contamination at FS-13 is residual. (The FS-13 groundwater investigation is covered in the FS-13 Groundwater Technical Review of this document.) Little contamination remains in the soil that is above Federal or State regulatory limits, despite the observation of stained soil with high field screening organic vapor concentrations and the detection of dieldrin in shallow subsurface soil. The SI also concluded that the field and analytical data support the concept that FS-13 has undergone significant degradation

due to leaching of pure product from source area soil by aquifer recharge as well as active biodegradation (Aneptek Corp., 1996).

AFCEE is currently evaluating the FS-13 source area sampling data. At this time, no remedy has been proposed for the FS-13 source area.

B. REMEDIAL/REMOVAL ACTIONS

This section presents the regulatory actions, removal action objectives (RAOs), and remedy description for the FS-13 source area.

B.1 Regulatory Actions

At this time, no remedy has been proposed for the FS-13 source area.

B.2 Removal Action Objectives (RAOs)

This subsection is not applicable since no remedy has been selected and FS-13 is presently in the CERCLA investigation process.

B.3 Remedy Description

This subsection is not applicable since no remedy has been selected and FS-13 is presently in the CERCLA investigation process.

B.4 Remedy Implementation

This subsection is not applicable since no remedy has been selected and FS-13 is presently in the CERCLA investigation process.

C. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

The following activities were conducted/observed for the FS-13 plume since the last review.

- Investigations of the FS-13 plume has taken precedence over the source area. At this time the USEPA is reviewing historical dieldrin data from MMR and a course of action is forthcoming.

D. SITE DISCUSSION

The technical assessment component of the five-year review consists of evaluating the protectiveness of the remedy; however, there is no remedy for this site, yet; therefore this section is not applicable.

Question A: Is the remedy functioning as intended by the decision documents?

This question is not applicable since no remedy has been selected and FS-13 is presently in the CERCLA investigation process.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Changes in Standards and To-Be Considered

This question is not applicable since no remedy has been selected and FS-13 is presently in the CERCLA investigation process.

Changes in Exposure Pathways

This question is not applicable since no remedy has been selected and FS-13 is presently in the CERCLA investigation process.

Changes in Toxicity and Other Contaminant Characteristics

This question is not applicable since no remedy has been selected and FS-13 is presently in the CERCLA investigation process.

Changes in Risk Assessment Methods:

This question is not applicable since no remedy has been selected and FS-13 is presently in the CERCLA investigation process.

Expected Progress Towards Meeting RAOS:

This question is not applicable since no remedy has been selected and FS-13 is presently in the CERCLA investigation process.

Question C: Has any other information come into light that could call into question the protectiveness of the remedy?

This question is not applicable since no remedy has been selected and FS-13 is presently in the CERCLA investigation process.

Technical Assessment Summary:

Table D-1 presents a Technical Assessment summary for the FS-13 source area.

Table D-1: Technical Assessment Summary for FS-13 Source Area

Question Item	Question	Response
A	Is the removal action functioning as intended by the decision documents?	N/A
B	Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the removal action selection are still valid?	N/A
C	Has information come to light that calls into question the protectiveness of the removal action?	N/A

E. ISSUES

Because analytical data demonstrates that regulatory limits for dieldrin were exceeded in soil at the FS-13 source area, further delineation of the contaminated soil is necessary to fully characterize the soil and to make a remedial determination.

F. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The SI concluded that data indicates that soil contamination in the source area has undergone significant decay due to biodegradation, leaching and attenuation. The following actions were recommended prior to the initiation of any further field investigations associated with the FS-13 source area:

Based on analytical results where regulatory limits for dieldrin were exceeded in soil, further delineation of the contaminated soil at the study area is necessary to determine a course of action at the FS-13 source area (i.e. No Further Action Decision Document, Engineering Evaluation/Cost Analysis, etc.) (Aneptek Corp., 1996).

G. PROTECTIVENESS STATEMENT

A protectiveness determination for the FS-13 source area cannot be made at this time until further information is obtained.

H. REFERENCES

Aneptek Corp., 1996. *Site Inspection Technical Memorandum, Fuel Spill Site FS*-13; IRP, MMR Cape Cod, MA; Prepared for Air National Guard Readiness Center, Andrews Air Force, Maryland; March, 1996.

E.C. Jordan, 1986 *U.S. Air Force Installation Restoration Program, Phase I: Records Search.* Air National Guard, Camp Edwards, U.S. Air Force, and Veterans Administration Facilities at MMR, Cape Cod. Prepared for HAZWRAP. Portland, Maine; 1986.

USEPA, 2001. *Comprehensive Five-Year Review Guidance*, EPA 540R-01-007, June 2001.

10.1 Category 4 Map

Placeholder for:
FIGURE 12:
MAP - CATEGORY 4 SITES

Table 6.-- Category 4 Sites (Under Investigation) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
CS-18	Chemical Spill 18	1987 Soil Contamination Study, 1994 USACHPPPM site Inspection, 1999 USAEHA Human Health Risk Assessment. Draft CS-18 Supplemental Site Investigation, October 2001. Final CS-18 Supplemental Site Investigation Technical Memorandum, anticipated November 2002.	The CS-18 site consists of an artillery firing point named Gun-Position #9. The burning of artillery propellants was conducted at CS-18 from approximately the early 1940's through 1992 and training exercises involving live artillery firing ceased in 1997.	None	Draft CS-18 Supplemental Site Investigation, October 2001. Final CS-18 Supplemental Site Investigation Technical Memorandum, anticipated November 2002. CS-18 Engineering Evaluation/Cost Analysis anticipated in November 2002.	None
CS-19	Chemical Spill 19 (Source)	1991-1992 Preliminary Assessment, 1992 Site Assessment, 1994 Limited-Focus Site Inspection, 2002 Remedial Investigation.	The findings from the PA support the idea that the CS-19 area was historically used as an ordnance and military waste disposal site, in addition to an artillery target area. The PA was based on a review of historical aerial photographs, depicting cleared brush and a open pit, and interviews with current and former base employees.	None	Draft Final Chemical Spill 19 Remedial Investigation Report, March 2002, and Final CS-19 Supplemental Groundwater Investigation Report, July 1999,	None
CS-19 GW	Chemical Spill 19 (groundwater)	1991-1992 Preliminary Assessment, 1992 Site Assessment, 1994 Limited-Focus Site Inspection, 2002 Remedial Investigation.	The findings from the PA support the idea that the CS-19 area was historically used as an ordnance and military waste disposal site, in addition to an artillery target area. The PA was based on a review of historical aerial photographs, depicting cleared brush and a open pit, and interviews with current and former base employees.	None	Draft Final Chemical Spill 19 Remedial Investigation Report, March 2002, and Final CS-19 Supplemental Groundwater Investigation Report, July 1999,	None
CS-23 GW	Chemical Spill 23 (groundwater)	Not Applicable	The SWOU study area was conceived as the area between the LF-1 and CS-10 plumes. Site records were reviewed to identify possible sources of SWOU groundwater contamination. The CS-23 plume was first detected al low concentrations of TCE during the pre-design activities for the CS-21 treatment system. Due to the detached nature of the CS-23 plume, the exact sources of the plume have not been discovered.	None	Not Applicable	RI is being conducted 2002-2003.

Table 6.-- Category 4 Sites (Under Investigation) Data Summary Table

Site (1)	Title (2)	Site Chronology (3)	Background (4)	Construction/Tank Removal/CERCLA Remedial Actions /CERCLA Removal Actions (5)	Progress Since Last Five-Year Review (6)	Remarks (7)
FS-13	Fuel Spill 13 Source	1996, Site Inspection Technical Memorandum.	Contamination is a result of a suspected AVGAS/JP-4 release along or near a section of a pipeline adjacent to the connery Avenue Rotary in 1972.	None	Groundwater underneath the source area was investigated and is being monitored in the long-term.	Recommend evaluate site data to determine if site needs further investigation or can be closed-out.

Notes:

1. "Site" column contains the Site Identifier (i.e. CS-1 CG). Sites with "Source" have groundwater contamination associated with them and denote the source area. Sites with "GW" denote groundwater contamination (i.e. plume). When neither "Source" nor "GW" follow the Site ID, then "Site" is assumed to be a source area only.
2. "Title" column contains the Site Name (i.e. Chemical Spill-1 Coast Guard)
3. "Site Chronology" column contains a brief listing of all major documents and the year of their finalization.
4. "Background" column contains a brief history of the site (i.e., site use and location).
5. "Construction/…" column contains a brief summary of all "cleanup" actions on the site including actions occurring during the report period.
6. "Progress Since last Five-Year Review" column contains a brief summary of IRP actions occurring during the report period.
7. "Remarks" column contains the document selecting the action on that particular site.

10.4 Category 4 Summary

Summarizing the category, there are no immediate threats to human health or the environment from any of these sites. Protectiveness statements for these sites must be deferred until adequate data becomes available regarding possible remedial actions.

11.0 Summary of Issues and Follow-up Actions

During the process of the five-year review, some specific issues were identified at certain sites. Although none of these put the overall protectiveness of any of the remedies in jeopardy, these issues are important to overall IRP program. As a result, recommendations were made as part of this report and the means for following up these recommendations were identified and summarized in Table 7. Although none of these issues adversely affects the status of any of the site's protectiveness, the resulting recommendations will be tracked through the regular activities of the MMR IRP stakeholder groups, which include community advisors and the regulators.

12.0 Protectiveness Statement

All existing cleanup remedies were found to be either currently protective of human health and the environment, protective in the short term, or are expected to be protective of human health and the environment upon attainment of ground water cleanup goals. For the first two, in the interim, exposure pathways that could result in unacceptable risks are being controlled and institutional controls are preventing exposure to, or the ingestion of, contaminated ground water.

Long-term protectiveness of the on-going and future remedial actions will be verified by obtaining ground water samples to fully evaluate the potential migration of the ground water plumes. Appropriate actions will be taken to assure continued protectiveness or progress towards ultimate protectiveness should this monitoring suggest risks may or have become unacceptable.

Protectiveness assessments for sites currently under investigation were deferred, as allowed by the guidance. All these sites were evaluated; however, and found to pose no imminent or substantial endangerment to human health or the environment.

13.0 Next Review

The next five-year review for the MMR Superfund Site is required by December 2007, five years from the date of the start of this review.

Table 7. -- Summary of Issues: Including Recommendations, Follow-up Actions

Issue No.	Document Reference	Site	Issue	Recommendation and Follow-Up Action	Responsible Party	Oversight Agency	Estimated Completion Date	Affects Protective-ness? (Yes/No)
1	9.3.1.E.	Ashumet Valley Ground Water	Infiltration trenches at Ashumet Valley Treatment plant are clogging, restricting the recharge of plant effluent.	A. Short term: Investigate methods of treating the condition. Perhaps, short term using chemical or physical means. B. Long term: Pursue effluent pretreatment options	AFCEE	EPA	A. Jan 03 B. Sep 03	A. No B. No
2	9.3.1.E.	Ashumet Valley Ground Water (Phosphorus)	Unknown effect of MMR contributions of phosporus to Ashumet Pond.	Continue phosporus management activities including development of phosphorus budget and continue operating the pilot test of iron-barrier reactive wall. Reevaluate pilot test to determine if a larger system is warranted.	AFCEE	EPA	Sep 03	No
3	9.3.1.E.	Ashumet Valley Ground Water	A. A final remedy needs to be selected because AV is one of the plumes in the IROD. B. Cleanup goals have not been met.	A. Develop schedule for process to select a final remedy. B. Continue to monitor and operate treatment system, and, as needed, optimize. Submit monitoring findings in annual report.	AFCEE	EPA	A. Sep 03 B. Aug 03	A. No B. No
4	9.3.3.E.	Chemical Spill No.4 Source Area	A. Confirmatory soil sampling needs to be evaluated to determine if removal is complete. B. Removal action documentation is incomplete.	A. Evaluate soil sampling data with regulatory agencies to determine next action. B. Submit draft removal action report for regulatory agencies' review.	AFCEE	EPA	A. Feb 03 B. Aug 03	A. No B. No
5	9.3.4.E.	Chemical Spill No.4 Ground Water	A. Existing extraction system is not removing entire contamination plume needs to be installed. B. Cleanup goals have not been met.	A. Submit Draft Wellfield Design Project Note for approval. B. Continue to operate treatment system, optimize and monitor for performance.	AFCEE	EPA	July 03	No
6	9.3.5.E.	Chemical Spill No.4 Coast Guard & Fuel Spill No.1 Coast Guard Source Area	Document removal action.	Submit draft removal action report.	AFCEE	EPA	Mar 03	No
7	9.3.6.E.	Chemical Spill No.5 Source Area	Document removal action	Submit draft removal action report.	AFCEE	EPA	Mar 03	No
8	9.3.7.E.	Chemical Spill No.8 Coast Guard Source Area	A. Implement selected removal action. B. Document removal action	A. Conduct removal action. B. Submit draft removal action report.	AFCEE	EPA	A. Dec 02 B. Mar 03	A. No B. No
9	9.3.8.E.	Chemical Spill No.10 Fuel Spill No.24 Source Area	A. Reevaluate ecological risk. B. Document removal action. C. Operate SVE system.	A. Submit draft revised ecological risk for Detail F. B. Submit draft remedial action report. C. Continue to monitor and operate SVE system, and, as needed, optimize.	AFCEE	EPA	A. Mar 03 B. Sep 03 C. NA	A. No B. No C. No

Table 7. -- Summary of Issues: Including Recommendations, Follow-up Actions

Issue No.	Document Reference	Site	Issue	Recommendation and Follow-Up Action	Responsible Party	Oversight Agency	Estimated Completion Date	Affects Protective-ness? (Yes/No)
10	9.3.9.E.	Chemical Spill No.10 Ground Water	A. Select final remedy for plume, including leading edge. B. Cleanup goals have not been met.	A. Continue RI/FS process towards a final ROD. Submit draft draft feasibility study. B. Continue to monitor and operate treatment systems, and, as needed, optimize. Submit draft annual report.	AFCEE	EPA	A. Mar 03 B. Nov 03	A. No B. No
11	9.3.10.E.	Chemical Spill No.11 Source Area	Document removal action.	Submit draft removal action report	AFCEE	EPA	Mar 03	No
12	9.3.11.E.	Chemical Spill No.16 & Chemical Spill No.17 Source Area	Finalize remedial action report.	Submit final remedial action report	AFCEE	EPA	Feb 03	No
13	10.3.1.E.	UNDER INVESTIGATION: Chemical Spill No.18 Ground Water	Additional soil sampling & ground water sampling needed at source area to determine cleanup requirement.	Submit draft technical memorandum containing results of soil and groundwater sampling event.	AFCEE	EPA	Jan 03	N/A Protectiveness Deferred
14	10.3.2.E.	UNDER INVESTIGATION: Chemical Spill No.19 Source Area	Additional soil sampling & ground water sampling needed.	Submit draft Engineering Evaluation/Cost Analysis document	AFCEE	EPA	Aug 03	N/A Protectiveness Deferred
15	10.3.3.E.	UNDER INVESTIGATION: Chemical Spill No.19 Ground Water	Additional up-gradient sources may exist for CS-19 ground water.	Submit draft Feasibility Study	AFCEE	EPA	Aug 03	N/A Protectiveness Deferred
16	9.3.12.E.	Chemical Spill No.20 Ground Water	Implement ground water treatment component of remedy.	Submit draft Wellfield Design Project Note	AFCEE	EPA	Jul 03	No
17	9.3.13.E.	Chemical Spill No.21 Ground Water	Implement ground water treatment component of remedy.	Submit draft Wellfield Design Project Note	AFCEE	EPA	Jul 03	No
18	9.3.14.E.	Chemical Spill No.22 Source Area	Document removal action.	Submit draft removal action report	AFCEE	EPA	Mar 03	No

Table 7. -- Summary of Issues: Including Recommendations, Follow-up Actions

Issue No.	Document Reference	Site	Issue	Recommendation and Follow-Up Action	Responsible Party	Oversight Agency	Estimated Completion Date	Affects Protective-ness? (Yes/No)
19	10.3.4.E.	UNDER INVESTIGATION: Chemical Spill No.23 Ground Water	Plume requires further evaluation.	Submit letter report with recommendations	AFCEE	EPA	Feb 03	N/A Protectiveness Deferred
20	9.3.15.E.	Coal Yard No.4 & Storm Drain No.3 & Fire Training Area No.3 Source Area	Document removal action.	Submit draft removal action report	AFCEE	EPA	Apr 03	No
21	9.3.16.E.	Drum Disposal Unit Source Area	Document removal action.	Submit draft removal action report	AFCEE	EPA	Mar 03	No
22	9.3.17.E.	Eastern Briarwood Ground Water	A. Final remedy needs to be selected. B. Complete next step -- risk evaluation.	A. Continue RI/FS process towards a final ROD. B. Submit draft risk evaluation.	AFCEE	EPA	A. Jan 03 B. Jan 03	A. No B. No
23	9.3.18.E.	Fuel Spill No.1 Ground Water	A. Reconstruct treatment plant and install 3 Ews as per ROD. B. Evaluate monitoring data while treatment system is not operating. C. Cleanup goals have not been met. D. Operate treatment system.	A. Reconstruct treatment plant, install 3 EWs, and restart treatment system. B. Provide monitoring data to regulatory agencies at regular technical update meetings. Submit draft annual report. C. Operate treatment system until cleanup goals are met. D. Submit next draft annual report.	AFCEE	EPA	A. Oct 03 B. Feb 04 C. 2017 D. Dec 02	A. No B. No C. No D. No
24	9.3.19.E.	Fuel Spill No.4 Source Area	Document no action based on sampling results	Issue remedial design fact sheet to document no action based on post-ROD sampling results.	AFCEE	EPA	Aug 03	No
25	9.3.20.E.	Fuel Spill No.5 & Storm Drain No.5 Source Area	A. Document remedial action of soil excavation & removal. B. Document SVE system. C. Operate & maintain SVE system.	A. Submit draft remedial action report. B. Submit draft ESD. C. Continue to monitor and operate SVE system and, as needed, optimze until cleanup goals are met.	AFCEE	EPA	A. Sep 03 B. Sep 04 C. Sep 03	A. No B. No C. No
26	9.3.21.E.	Fuel Spill No.6 & Fuel Spill No.8 & Storm Drain No.2 Source Area	Complete remedial action documentation.	Submit draft remedial action report.	AFCEE	EPA	Sep 03	No

Table 7. -- Summary of Issues: Including Recommendations, Follow-up Actions

Issue No.	Document Reference	Site	Issue	Recommendation and Follow-Up Action	Responsible Party	Oversight Agency	Estimated Completion Date	Affects Protective-ness? (Yes/No)
27	9.3.22.E.	Fuel Spill No.7 Source Area	Complete remedial action documentation.	Submit draft remedial action report.	AFCEE	EPA	Sep 03	No
28	9.3.23.E.	Fuel Spill No.10 & Fuel Spill No.11 & Petroleum Fuel Storage Area Source Area	A. Last of 6 zones of SVE/Biosparge system has not been installed. B. Document interim remedial action.	A. Install 6th zone of SVE/Biosparge system. B. Submit draft interim remedial action report.	AFCEE	EPA	A. Mar 03 B. Sep 03	A. No B. No
29	9.3.25.E.	Fuel Spill No.12 Ground Water	Final remedy needs to be selected.	Submit draft risk evaluation.	AFCEE	EPA	Jun 03	No
30	9.3.26.E.	Fuel Spill No.13 Ground Water	A. Cleanup goals have not been met.	Continue monitoring until cleanup goals are met.	AFCEE	EPA	Jan 03	No
31	10.3.5.E.	UNDER INVESTIGATION: Fuel Spill No.13 Source Area	Additional contaminants may be present at source area.	Evalute existing data and determine next step.	AFCEE	EPA	Mar 03	N/A Protectiveness Deferred
32	9.3.27.E.	Fuel Spill No.18 Source Area	Complete removal action documentation.	Submit draft removal action report.	AFCEE	EPA	Mar 03	No
33	9.3.28.E.	Fuel Spill No.28 Ground Water	A. Cleanup goals have not been met. B. Operate treatment system.	A. Continue to monitor and operate treatment system and, as needed, optimize until cleanup levels are met. B. Submit next annual report.	AFCEE	EPA	A. Sep 03 B. Sep 03	A. No B. No
34	9.3.29.E.	Fuel Spill No.29 Ground Water	Implement ground water treatment component of remedy.	Submit Draft Wellfield Design Project Note	AFCEE	EPA	Jul 03	No
35	9.3.32.E.	Landfill No.1 Ground Water	A. Final remedy needs to be selected. B. Operate treatment systems	A. Develop and submit schedule to select final remedy. B. Continue to monitor and operate treatment systems and, as needed, optimize until cleanup goals are met.	AFCEE	EPA	A. Sep 03 B. Jan 03	A. No B. No

Table 7. -- Summary of Issues: Including Recommendations, Follow-up Actions

Issue No.	Document Reference	Site	Issue	Recommendation and Follow-Up Action	Responsible Party	Oversight Agency	Estimated Completion Date	Affects Protective-ness? (Yes/No)
36	9.3.34.E.	Storm Drain No.4 Source Area	A. Complete ecological risk evaluation of soil adjacent to pond. B. Document decision.	A. Submit draft ecological risk evaluation. B. Submit draft ESD.	AFCEE	EPA	A. Mar 03 B. Sep 04	A. No B. No
37	9.3.35.E.	Storm Drain No.5 Ground Water	Final remedy needs to be selected.	Submit draft risk evaluation.	AFCEE	EPA	Mar 03	No
38	9.3.36.E.	Western Aquafarm Ground Water	Final remedy needs to be selected.	Submit draft risk evaluation.	AFCEE	EPA	Jan 03	No

APPENDIX A

ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS

AFCEE	Air Force Center for Environmental Excellence
ANG	Air National Guard
ANGB	Air National Guard Base
AOC	Area of Contamination
ARNG	Massachusetts Army National Guard
ARARs	applicable or relevant and appropriate requirements
bgs	below ground surface
BOMARC	Boeing-Michigan Aeronautic Research Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act of 1986.
CG	United States Coast Guard
COC	contaminant of concern
CS	Chemical Spill
CY	Coal Yard
DDOU	Drum Disposal Operable Unit
DEP	Massachusetts Department of Environmental Protection
DoD	Department of Defense
DSRP	Drainage Structure Removal Program
EE/CA	Engineering Evaluation/Cost Analysis
EDB	Ethlyene Dibromide
EPA	Environmental Protection Agency
EPH	extractable petroleum hydrocarbon
ESD	Explanation of Significant Differences
FS	Fuel Spill
FTA	Fire Training Area
HQ	Hazard Quotient
IROD	Record of Decision for Interim Action
IRP	Installation Restoration Program
LTM	Long Term Monitoring
MADEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
MCL	Maximum Contamination Level
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram

MMR	Massachusetts Military Reservation
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NGB	National Guard Bureau
PA	preliminary assessment
PAH	polycyclic aromatic hydrocarbon
PCE	Tetrachloroethylene, or Perchloroethylene
PFSA	Petroleum Fuels Storage Area
PRA	preliminary risk assessment
PRE	preliminary risk evaluation
RAL	removal/remedial action level
RAO	removal action objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SARAP	Source Area Remedial Action Program
SD	Storm Drain
SERGOU	Southeast Region Groundwater Operable Unit
SI	Site Investigation
STCL	Soil Target Cleanup Level
SVE	soil vapor extraction
SVOCs	semivolatile organic compounds
TAL	target analyte list
TBC	to be considered
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TPH	total petroleum hydrocarbons
TRET	Technical Review and Evaluation Team
TSDF	Transfer Storage Disposal Facility
USAF	United States Air Force
USCG	United States Coast Guard
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
UTES	Unit Training Equipment Site
VOCs	volatile organic compounds
VPH	volatile petroleum hydrocarbon